MODERN PLASTICS

E. F. LOUGEE, Editor
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Cover color this month is COPPERCLAY (created by Textile Color Card Association)

Next Month

So many readers have requested information lately about the use of synthetics in varnish and lacquer that we have persuaded A. G. Hovey of Beck, Koller & Co., Inc., one of the world's largest producers of surface coating synthetics, to write a story which he has labeled "Changes in Finishing Materials."

This will appear in our December issue together with the second installment of "Molds for Phenol Resinoids" by T. E. Cassey, Chief Electrical Draftsman of the Bureau of Engineering, Navy Department.

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INSUROK

WE congratulate the McGill Manufacturing Company upon receiving an award for this light-weight, fully-insulated, abuse- and heat-resisting lamp guard with integrally molded reflector. The Richardson Company is proud to have had a part in the development of this lamp guard, a product of superior quality, molded of INSUROK.

The Superior Plastic

INSUROK, the superior plastic by Richardson, is used in thousands of parts and finished products that every day maintain, and widen, their market through inherent, obvious quality and extraordinary performance against the most vigorous competition. Such achievement is invariably the result of close cooperation between manufacturer and the Richardson technical staff, supported by Richardson unmatched facilities for the economical, volume production of molded INSUROK, and other plastics, to precise tolerances. It will be to your profitable advantage to select Richardson as your sole source of supply, as other manufacturers have done. Details will gladly be sent on request.

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MODERN PLASTICS
NOVEMBER 1937 VOLUME 15 NUMBER 3

COMPETITION RESULTS

THE SECOND ANNUAL MODERN PLASTICS COMPETITION HAS ARRIVED, BEEN JUDGED, AND IS ON DISPLAY AT 425 FOURTH AVENUE WHERE OUR READERS ARE CORDIALLY INVITED TO REVIEW THE ENTRIES.

One year is a comparatively short period of time and yet, since the inauguration of our First Competition a year ago the advance of the plastics industry in new fields and old is clearly evidenced in the entries this year. Nothing perhaps, could indicate the scope of this advance better than the hundreds of examples of engineering ingenuity and designing skill which are gathered together here for graphic comparison and examination.

New materials and new methods command interest and attention while sharing honors in the awards with materials which have become firmly entrenched in the every day life and shop practice in practically all branches of industrial production. Notable in the year's progress are the acrylic and methyl methacrylic resins with their novel applications where crystal clear transparency is a desirable functional or decorative factor.

Transparent phenolic resins, which made their appearance this year, suggest a wealth of new uses for this versatile thermosetting molding compound which the judges did not overlook. Cast resins assume new importance in the development of two cast housings which won awards. This represents an entirely new method of handling this plastic which in recent years has been recognized chiefly as a material for machining and fabri-

cating into small objects such as jewelry, buckles, buttons, handles and such.

Pioneering in a competition of industry which travels at such pace is a hazardous undertaking. Experience with entries last year indicated that some greater diversity of classifications was advisable in fairness to those entering and a Scientific Group was established this year.

When entries in the Decorative Group began to arrive for this Second Competition it became obvious that to attempt to include all household accessories in this group would operate to their disadvantage and confusion so a new classification called the Household Group, was set up.

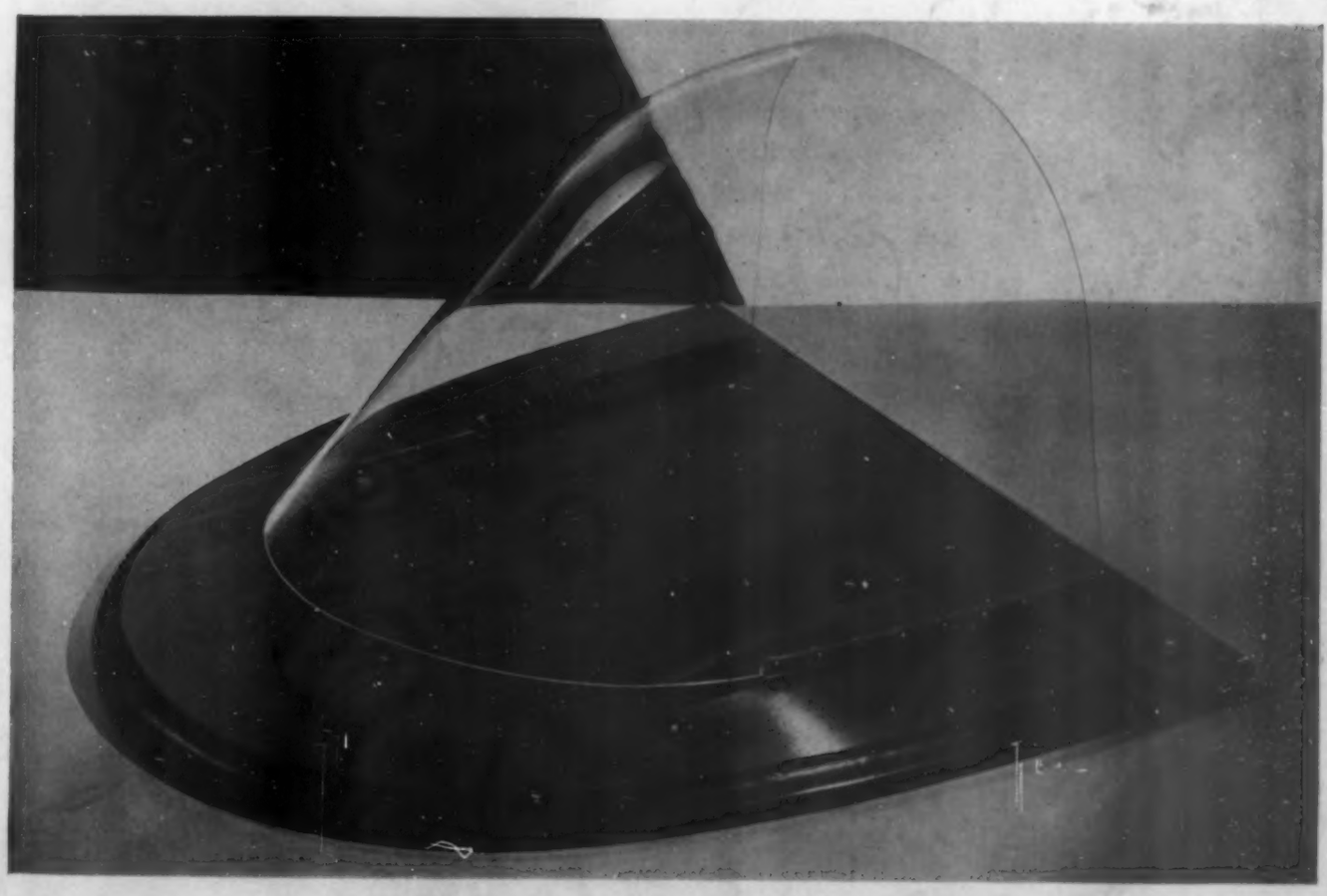
Therefore, judging of the Competition was based upon five classifications instead of four as announced, and those entries which won Awards and Honorable Mention are pictured and described on the pages that follow.

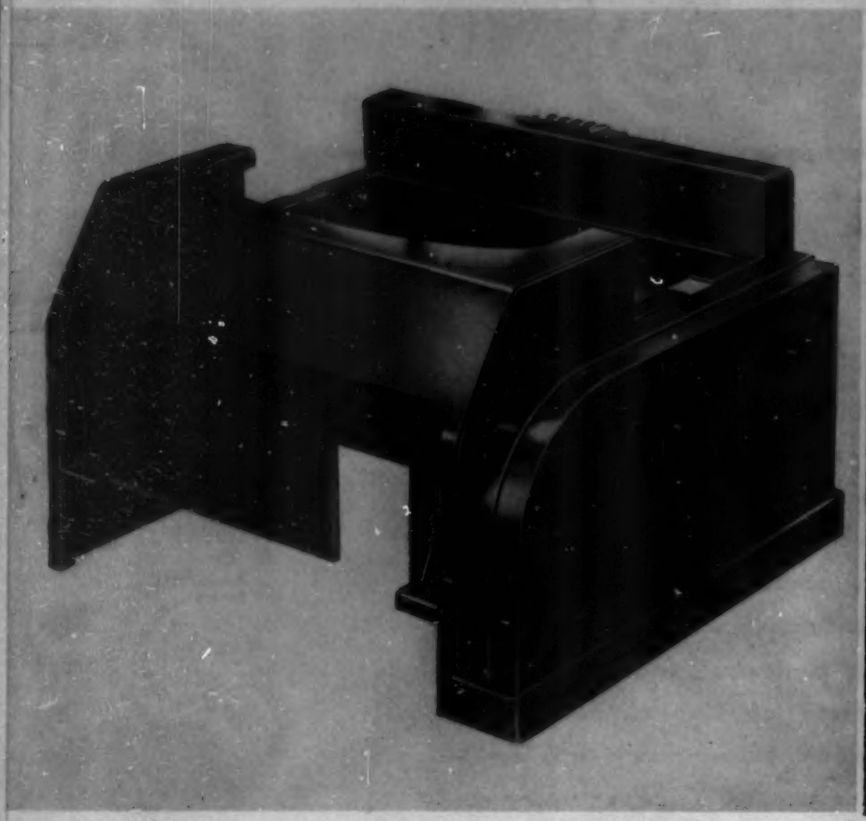
Awards, which consist of all plastic plaques suitably engraved for the companies entering and participating in the winning entries, will be presented at a dinner to be held on the evening of November 17, in the Grand Ball Room at the Hotel New Yorker, New York City, where the winning entries will be displayed. All entries will remain on exhibit at our Auditorium, tenth floor, 425 Fourth Avenue, New York City, until December 15. You are cordially invited to visit this remarkable display of the latest products of the Plastics Industry.

INDUSTRIAL FIRST AWARD

Belanca Aircraft Corporation, Newcastle, Delaware, wins First Award in the Industrial Group for its Airplane Windshield. The windshield is formed from sheet Plexiglas, a methyl methacrylate material made by Röhm & Haas Company, Philadelphia, Pa., who also mold or form the part ready for installation. Andrew F. Haiduck, of the Belanca Corporation is responsible for the design.

"Plexiglas was used in this airplane windshield," says Dr. D. S. Frederick (Röhm & Haas Company), "because it offered the advantages of light weight, high impact strength, and streamlining. This plastic affords a great saving in weight as it can be used in a very thin section and its specific gravity is only 1.18. Its high impact strength greatly reduces the danger of breakage, and even though it were broken from a hard blow, it would not shatter and the edges of the pieces would not be sharp. The ease with which the plastic sheet can be formed into a three dimensional curve makes it possible to use a windshield which exactly conforms to the streamlined fuselage of the airplane. The colorless transparency and resistance against aging of this particular plastic make it ideally suited for use in windshields and cockpit enclosures for aircraft."





INDUSTRIAL SECOND AWARD

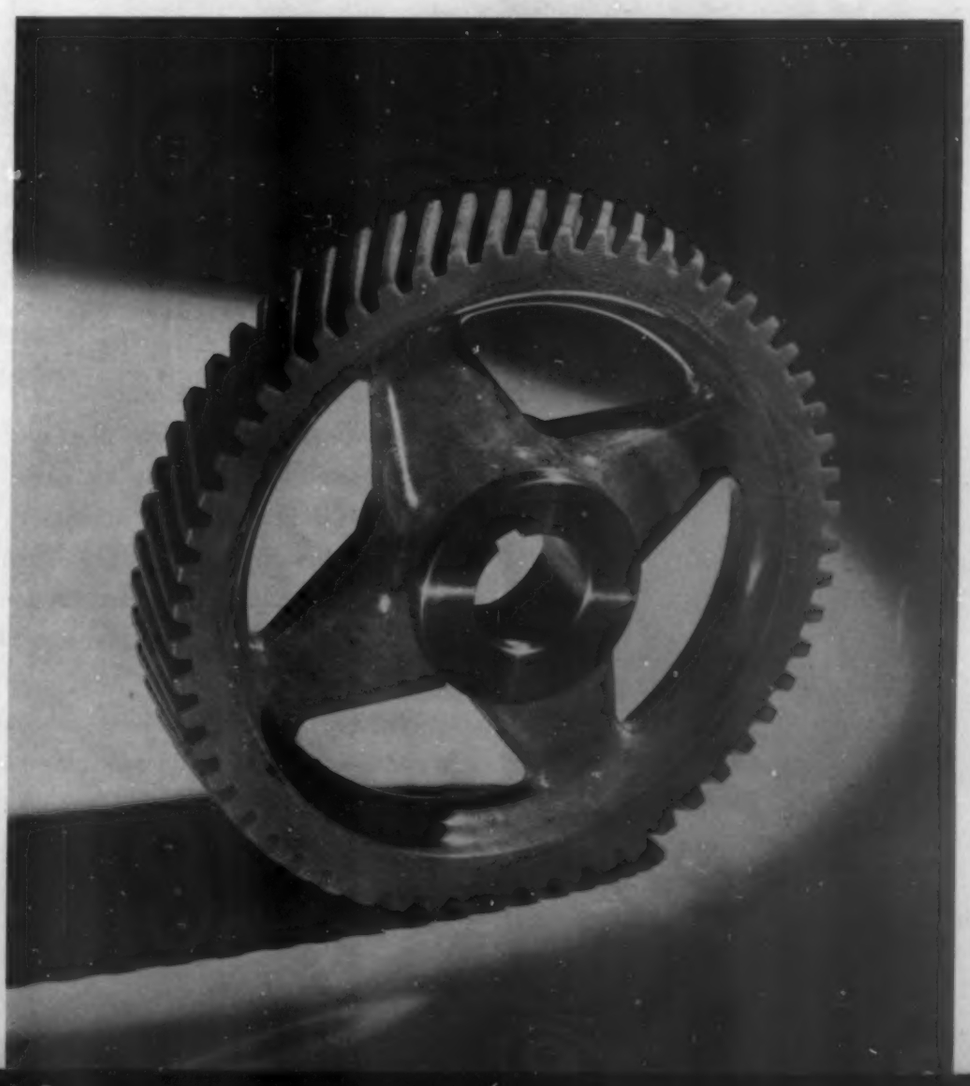
Western Union Telegraph Company, New York City, takes Second Award in the Industrial Group with its Western Union Teleprinter. The housing, or outer casing, of the Teleprinter is molded of Textolite, a phenolic resin, by the Plastics Department of General Electric Company, Pittsfield, Mass., who also make the material. Victor Weidner and Fenick A. Vogel, engineers for Western Union Telegraph Company, were jointly responsible for the design.

"Our reason for choosing plastics," says P. J. Howe, central office engineer of Western Union, "is because they are intriguing materials. They are attractive in themselves and permit decorative line work in their surfaces and require no finishing. Repairing and refinishing are completely avoided and different colors may be introduced without additional mold cost. Perhaps a cheaper housing could have been made from another material but it could not have been as attractive in appearance nor could we have built it in all one piece which we set out to do."

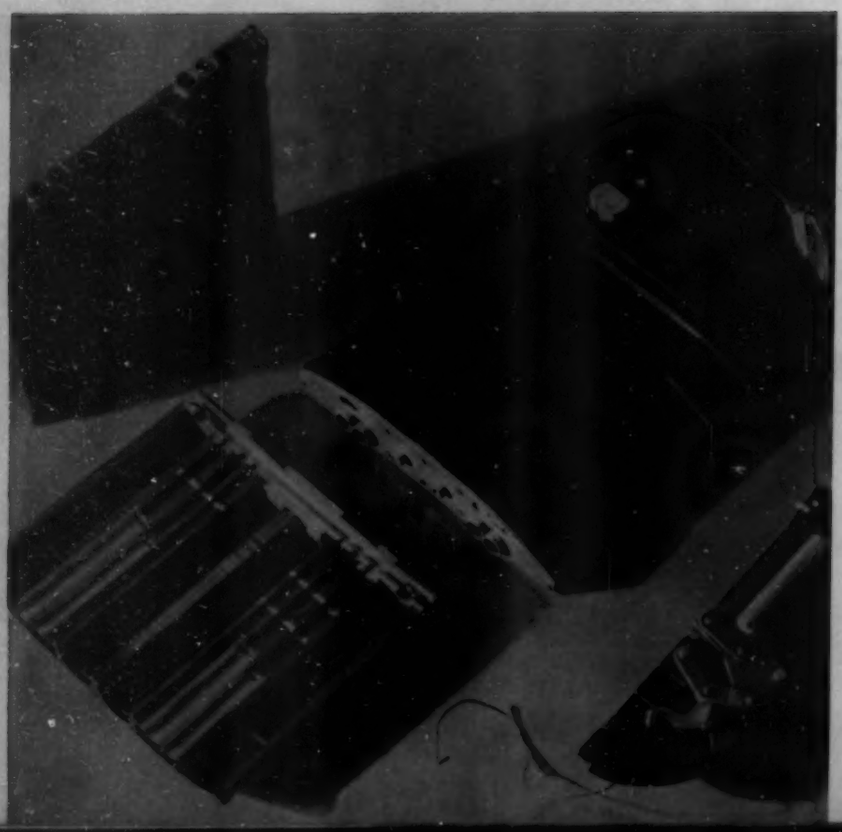
INDUSTRIAL THIRD AWARD

The Studebaker Corporation, South Bend, Ind., wins Third Award in the Industrial Group with the novel use of a laminated phenolic spoke gear in its motor timing mechanisms. The spoke gear is molded by Continental-Diamond Fibre Company, Newark, Delaware, from a material of its own manufacture, called Celoron. Frank Benge, company engineer, is responsible for the design.

This gear is one of several types of molded Celoron spoke gears used on camshafts of several modern automobile motors. It represents the most advanced step in the evolution of non-metallic gears for elimination of noise in the timing mechanism of high-speed motors. The spoke design imparts greater resiliency to the gear than is possessed by web gears. By reducing the area and changing the shape of the vibrating components of the gear it has been possible to eliminate resonance and to reduce the noise volume by 60 percent. The resiliency of the spoke gear is responsible for shock resist-force six to ten times greater than that of the more rigid web gear. Under identical test conditions, the spoke gear withstood 500 blows of 11 foot-pound pace before tooth failure as compared to 50 blows for the web gear.



SCIENTIFIC FIRST AWARD



Bankers Protection Company, Simsbury, Conn., wins First Award in the Scientific Group with the Tracelarm Bag which is typical of the application of science to a thoroughly practical protection of money, securities and other valuables in transportation. This entry was designed and developed by G. W. Brown and W. L. Nahm of Bankers Protection Company. The plastic parts were molded by Remler Company, Ltd., San Francisco, Cal., of Durez, a phenolic material made by General Plastics Inc., North Tonawanda, N. Y.

Tracelarm is a steel-mesh lined Messenger Bag fitted with a mechanism which instantly operates when snatched from the messenger carrying it. This mechanism automatically locks the bag and ten seconds later produces a series of detonations to attract attention, and for several minutes emits dense streams of yellow tracer-smoke for police pursuit and to thwart escape by automobile.

With its various inserts which must never fail to function, it is one of the most intricate moldings ever made of plastics."

SCIENTIFIC SECOND AWARD

White Manufacturing Company, St. Paul, Minn., won Second Award in the Scientific group with the White Thermostat for use in modern homes. The housing is molded of Plaskon, a urea material made by Plaskon Company Inc., Toledo, Ohio, by Chicago Molded Products Corporation, Chicago, Ill. It was designed by Barnes & Reinecke, also of Chicago.

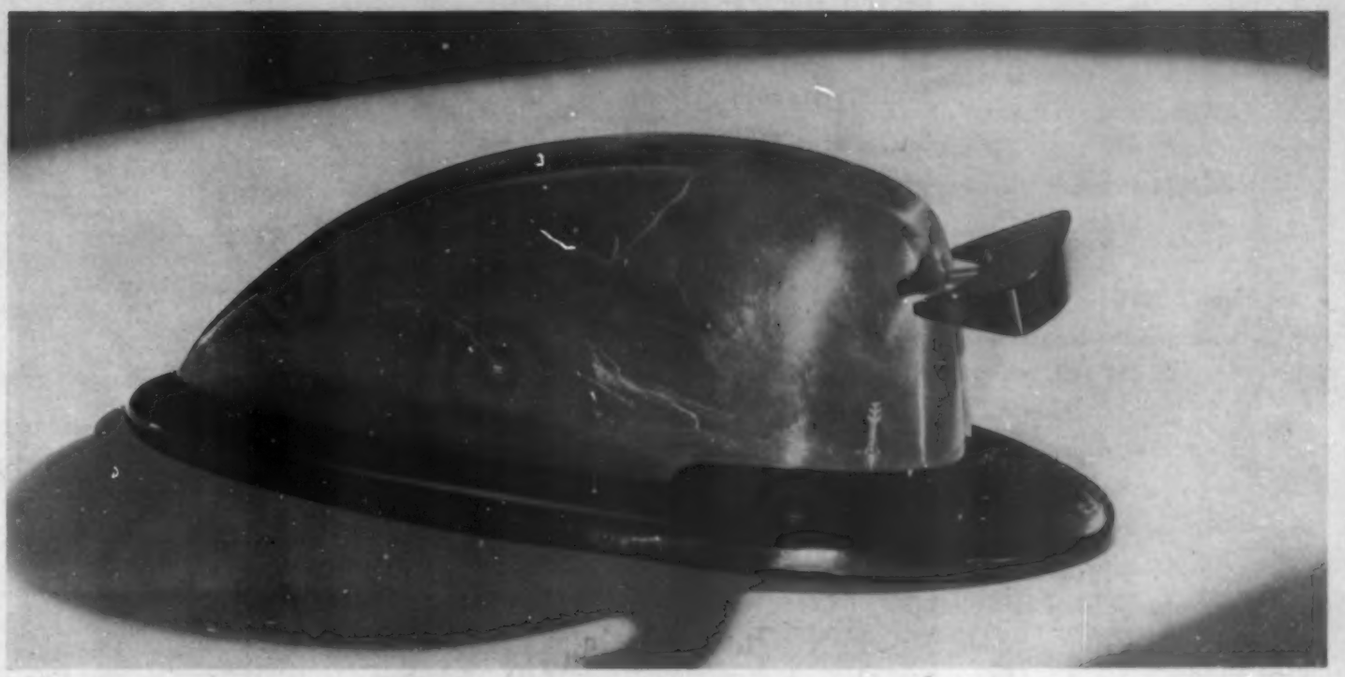
By redesigning the housing of the White Technotrol Thermostat for plastics instead of metal, more flowing lines and better appearance were achieved, according to Mr. Payne of Chicago Molded Products Corp. The dark line down the center of the housing accents the vertical line of the thermometer, ties it up with the clock and divides the otherwise unbroken mass of the case. Then by recessing the thermometer, the unsightly ball, etched backplate, mounting screws and straps are hidden from view, leaving only the tube itself exposed.

This new housing in white or pastel colors harmonizes better with home interiors than the painted metal case it replaced.

SCIENTIFIC THIRD AWARD

Burton Manufacturing Company Inc., Chicago, Ill., was awarded Third Place in the Scientific Group for its Oculite Dental Operating Light. The housing of the light which contains its reflector is of molded Bakelite, a phenolic material made by the Bakelite Corporation, New York City. Barnes & Reinecke, Chicago, were its designers and the molded parts were manufactured by Chicago Molded Products Corporation, Chicago, Ill.

This Dental Operating Light illustrates in a striking way what can be accomplished by close cooperation between engineer, industrial designer, molder and plastic material supplier. Each element of the Oculite was scientifically developed to meet predetermined specifications drawn from careful and thorough analysis of the dentist's requirements. These specifications demanded that the light be easy to operate, free from glare, heat insulated, able to develop maximum light from minimum current, and possess pleasing, professional appearance. The outer shield is made of either black or mahogany Bakelite and a reading box is attached which enables the operator to refer to an X-ray film of the patient as he works.



DECORATIVE FIRST AWARD

E. H. Hotchkiss Company, Norwalk, Conn., received First Award in the Decorative Group for its "Aristocrat" Stapling Machine. The plastic housing is Catalin, a cast phenolic resin made by Catalin Corporation, New York City, machined and finished by Plastic Turning Company Inc., Leominster, Mass. Orlo Heller of Bortic Studios, New York City, was co-designer of this entry with the Hotchkiss Company.

"Interest in this entry," says Harvey Wiley Corbett, one of the judges, "lies in the successful use of a new material in screening an otherwise ugly piece of office furniture. The form is simple and the color well selected. It makes a much neater appearance on a desk where such things are necessary."

"Two years ago," says C. M. Harrington of the Hotchkiss Company, "we decided to attempt to design the 'most beautiful stapler in the world.' Stapling devices up to that time had been designed only from a utilitarian point of view. We believe we have accomplished our aim in the Aristocrat which provides a modern appearance suitable for any executive's desk or for the home and none of its operating efficiency has been sacrificed to this end."

DECORATIVE SECOND AWARD

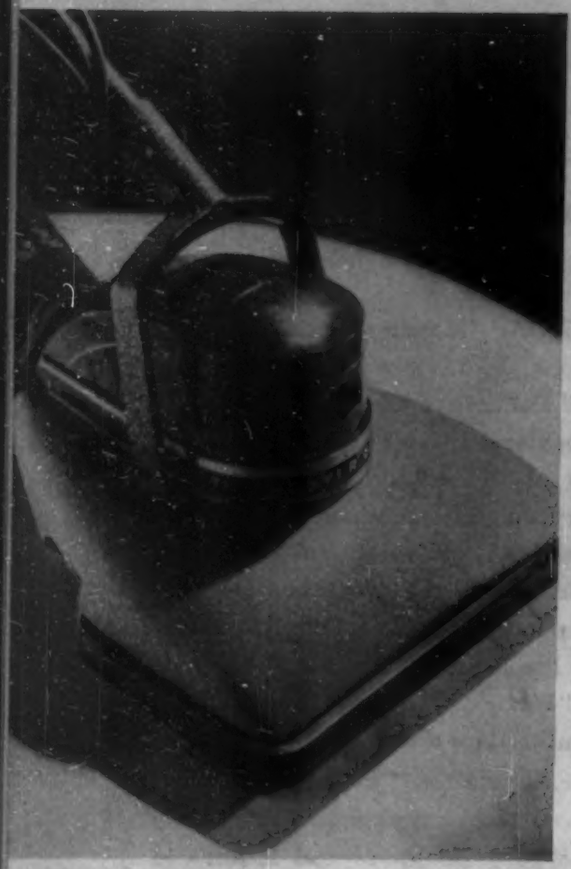
International Radio Corporation, Ann Arbor, Mich., was awarded Second Honors in the Decorative Group for the Kadette Clockette Radio. Its colorful case is of Fiberlon, a cast phenolic resin made by Fiberloid Corporation, Indian Orchard, Mass., which was fabricated and finished by Paul Norris, Wellston, Ohio. Sundberg & Ferar, Detroit, Mich., were its designers.

This marks the first application of cast resin in radio cabinet use and its fabrication is a definite departure from the usual method of molding such housings. The material is cast in inexpensive lead molds to the approximate shape, then the grooved lines, radii, steps, etc., are worked out with regular wood-working machinery and later polished. This permits a variety of individual designs without excessive mold cost and the translucency of the material with its light diffusing qualities lends itself to dramatic lighting effects by the simplest means.

DECORATIVE THIRD AWARD

C. K. Castaing Studio, Stony Brook, L. I., won Third Award in the Decorative Group for a Center Piece and three Flower Vase Holders of Plexiglas, a methyl methacrylate material made by Röhm & Haas Co., Philadelphia, Pa. They were designed by Mr. Castaing and carved by hand in his studio for exclusive retail distribution.

"Plexiglas was chosen for this center piece and vase holders," says Mr. Castaing, "because the material is obtainable in almost any size and thickness and is easy to cut. Being clear as crystal, the finished product has the beauty and delicacy of etched crystal without being fragile, and is entirely appropriate for table decoration in combination with silver, real crystal and fine china. Its weight is about one-third that of glass, it is unharmed by alcohol, and will not break if dropped. This same material in a variety of individual treatment and design holds unlimited possibilities in architectural decoration and in the manufacture of decorative items and portable and permanent lighting fixtures for interior design."



HOUSEHOLD FIRST AWARD

The Hoover Company, North Canton, Ohio, took First Award in the Household Group for its Hoover Twenty-five Cleaning Ensemble. Durez, made by General Plastics, Inc., North Tonawanda, New York, and Bakelite, made by Bakelite Corporation, New York City, were the phenolic molding materials used and the Hoover Company did its own molding. The parts were assembled with hardened self-tapping screws made by Parker-Kalon Corporation, New York City. Henry Dreyfuss, New York City, was responsible for the design. This is a new product placed on the market in September of this year.

"The motor hood, motor case, cleaning tool parts, ventilating fan, agitator ends, bag connector, wheels, and other small parts are of molded plastics," says F. L. Pierce of the Hoover Company, "because they are light weight, permanent in luster and color, possess good electrical insulating properties, and provide greater design freedom in shape, detail, and color. The unique molded motor hood was produced from a special extra-strength material developed for the part, which, with inside reinforcing ribbing, produced a rugged molding that will withstand more than ordinary abuse in service.

HOUSEHOLD SECOND AWARD

Chase Brass & Copper Co., Inc., Waterbury, Conn., wins Second Award in the Household Group with two entries: Electric Table Chef and Coronet Coffee Urn, which are styled to be used together. The plastics used for handles and other decorative parts is Beetle a urea material manufactured by American Cyanamid Company, New York City. The molding was done by the Plastic Molding Corp., Sandy Hook, Conn., and Walter von Nesson, New York City, is responsible for their design.

Styled in the modern manner, finished in polished chromium with plastic handles, knobs and base, these twin implements of the modern hostess demonstrate a successful combination of materials to achieve design, beauty and utility and to bring forth the intrinsic merits of each material. Urea plastics were used because of the decorative value they impart and because of their cleanliness and inertness in connection with food, and because a wide range of light and pure colors are available.

HOUSEHOLD THIRD AWARD

Steelsmiths, Inc., Meriden, Conn., won third award in the Household Group with their recently introduced "Servet" Stainless Steel Cooking and Serving Line. The trays on which the dishes are placed are made of Plaskon, a urea material, manufactured by Plaskon Co., Inc., Toledo, Ohio and were molded by the General Electric Co., at its Meriden, Conn., plant. Edward Conroy of Steelsmiths, Inc., designed the line.

Servet stainless steel with plastic heat-proof serving trays represents a new use for both materials through which it is possible to serve food in the dining room in the same utensil in which it is cooked in the oven or over an open flame. Through the insulating properties of the plastic used, the dining table is protected from the heat of the dish and the tray is so designed that three small feet raise it sufficiently from the table to guarantee a circulation of air beneath. Stainless steel pins are inserted in the tray to contact the hot dish and raise it about one-sixteenth of an inch from the bottom, permitting air to circulate beneath the dish, which prevents discoloring the material.

STYLE FIRST AWARD

Louisesanders, New York City, wins First Award in the Style Group with this chic Cocktail Hat, designed especially for the Competition. The plastic used for its decoration is Plastacele, a cellulose acetate material manufactured by the Plastics Dept. of E. I. du Pont de Nemours & Co., Inc., Arlington, N. J., and fashioned in Louisesanders' own shop.

Through clever manipulation, a thick sheet of Plastacele is dexterously converted into an airy, scintillating and jet-like effect so suitable for the present vogue. Fashions in general go back to the glitter and magnificence of opulent times so that Plastacele with its glint and sparkle, its light weight and durability, is ideal for dinner or cocktail hats. For the evening coiffure a romantic wisp of black tulle is sprinkled with tiny flowers or birds cut from Plastacele and draped over the head. Daytime hats of felt are equally delightful when trimmed with plastic quills or ornaments, which lend a charming highlight to the feminine costume.

STYLE SECOND AWARD

Harriet Hubbard Ayer, New York City, wins the Second Award in the Style Group for the practical use of plastic jars in a Campus Kit. The outer shells of the jars are made of Plaskon, a urea material manufactured by Plaskon Co. Inc., Toledo, Ohio, while the inner jars are made of Coltrock, a specially inert phenolic material manufactured by the Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., who also did the molding. I. Alter of the Arcadia Powder Puff Co., New York City, and Lillian S. Dodge of the Harriet Hubbard Ayer Company, were co-designers of the Campus Kit.

Through the use of plastic material the weight of this Campus Kit was considerably reduced, breakage through shipping was brought to a minimum because the material is highly shock-resistant. The combination of the inner jar with its imperviousness to moisture, oils, creams or any of the ingredients of cosmetics, together with its outer shell, which serves as an enclosure, represents the most advanced procedure in cosmetic and similar packaging.

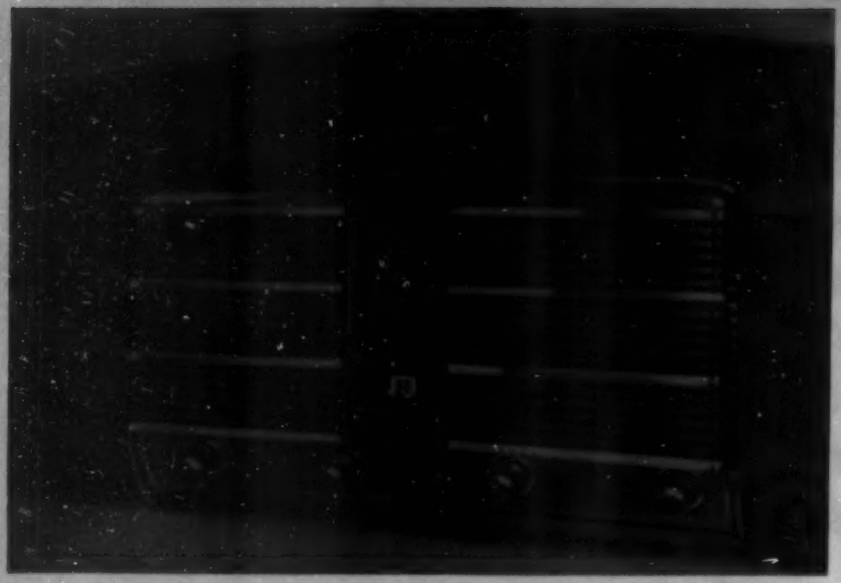
STYLE THIRD AWARD

Shields, Inc., Attleboro, Mass., wins Third Award in the Style Group with a Combination Cigaret Case and Vanity. Both top and bottom lids of the case are transparent Catalin or Prystal, a cast phenolic resin made by the Catalin Corp., New York City, and fabricated in Shield's own plant. A. Graham Shields designed it.

This combination of transparent Catalin and gold metal gives a smart appearance to an entirely practical case. Cigarets in the top half are clearly visible and to the back of the transparent plastics cover on the reverse side, a mirror is attached for convenient make-up use. Loose powder is contained inside the case and a puff is held in place, preventing its coming in contact with the mirror, by a thin cellulose acetate sheet. This combining of cast resin sheets with metal finds increasing favor with jewelry and novelty manufacturers and the hardness of the material together with the permanence of its attractive colors recommends it strongly for such decorative use.

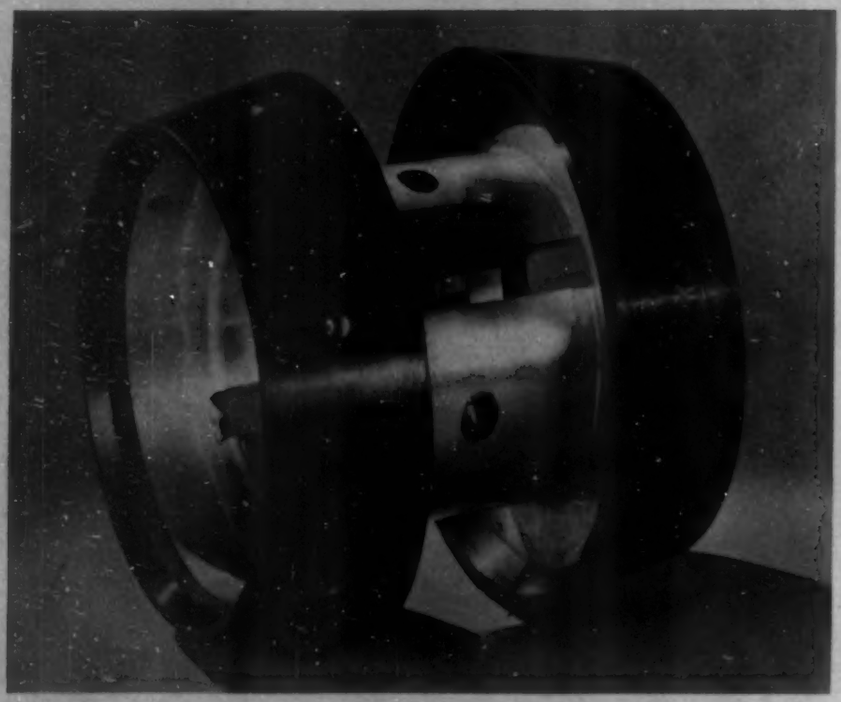
NO ONE WHO HAS ANY INTEREST IN PLASTIC MATERIALS OR IS CONSIDERING THEIR USE IN ANY OF HIS OWN PRODUCTION PROBLEMS, CAN AFFORD TO MISS THIS EXHIBIT OF ENTRIES IN THE SECOND MODERN PLASTICS COMPETITION. HUNDREDS OF ITEMS EXEMPLIFYING THE MOST ADVANCED AND INTELLIGENT USE OF THE MATERIALS ARE GATHERED TOGETHER IN OUR AUDITORIUM AT 425 FOURTH AVE., NEW YORK CITY, WHERE THEY MAY BE SEEN ANY WEEK DAY FROM 9 A.M. TO 5 P.M. THERE ARE FIVE GROUPS DEMONSTRATING THE USE

OF ALL TYPES OF PLASTIC MATERIALS IN INDUSTRIAL, SCIENTIFIC, DECORATIVE, HOUSEHOLD AND STYLE APPLICATIONS, MANY OF WHICH REPRESENT SOME OF THE MOST COMPLEX ENGINEERING PROBLEMS THAT HAVE BEEN WORKED OUT WITH INTRICATE MOLDING AND LAMINATING TECHNIQUE. THE DECORATIVE AND STYLE GROUPS INDICATE THEIR DESIGN POSSIBILITIES AND THEIR DEFINITE TRENDS. WHATEVER YOUR INTEREST IN PLASTICS MAY BE, WE URGE YOU TO SEE THIS EXHIBIT BEFORE ITS CLOSING ON DECEMBER 15TH.



INDUSTRIAL HONORABLE MENTION

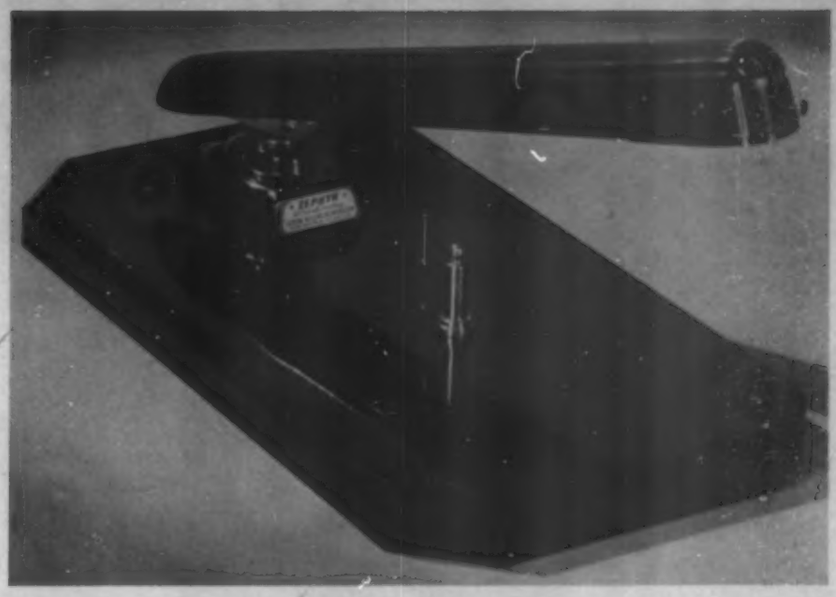
• To Cadillac Motor Division, General Motors Corp., Detroit, Mich., for Radio Grille designed by its own Styling Section and molded of Tenite, a cellulose acetate material made by Tennessee Eastman Corp., Kingsport, Tenn., by Norton Laboratories, Inc., Lockport, N. Y. This Radio Grille and assembly is novel in appearance and finish as well as in mechanical arrangement and the knobs beneath are made of the same material to match.



• To Brown & Sharpe Mfg. Co., Providence, R. I., for Clutch Body Ring to fit friction pulley. Designed by Brown & Sharpe Engineers, this part is fabricated from Textolite by the Plastics Dept. of the General Electric Co., Pittsfield, Mass. Plastics were used in this application principally because of increased operating service due to the toughness and long life of phenolic laminated materials.

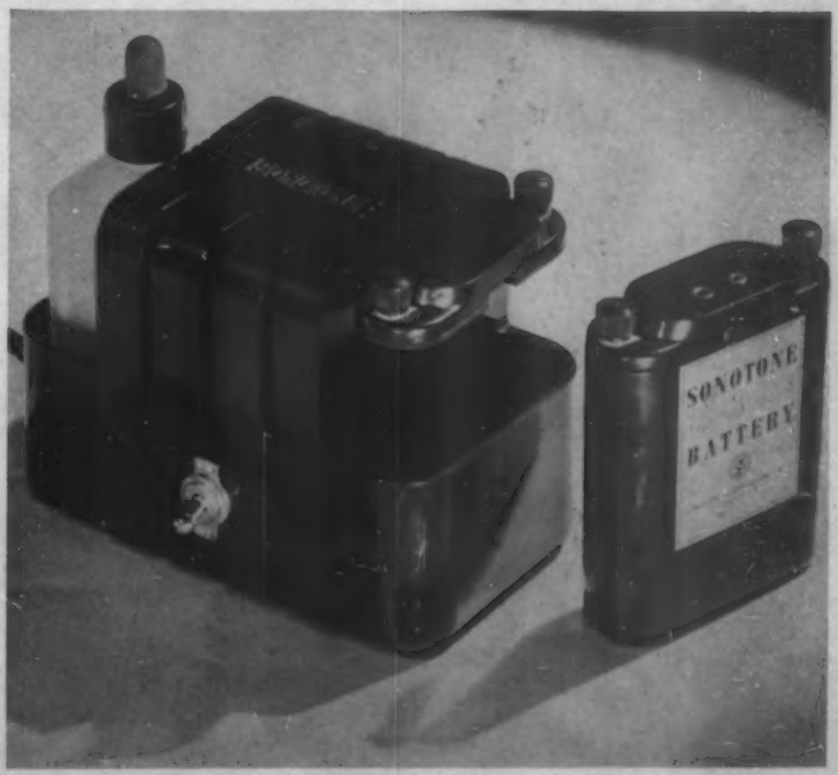
• To McGill Mfg. Co., Valparaiso, Ind., for a Lamp Guard Cage designed by Marvin Carlson of Hobart, Ind. This is molded Insurok, a fabric-filled phenolic material, by The Richardson Company, Melrose Park, Chicago, Ill. The reflector is of Bakelite made by the Bakelite Corp., New York City. It is only through the use of such laminated, fabric-filled material that a non-metallic lamp guard could be made with sufficient strength, durability and absolute insurance against short circuiting where contact with a metal guard would cause breakdown or injury.

SCIENTIFIC HONORABLE MENTION

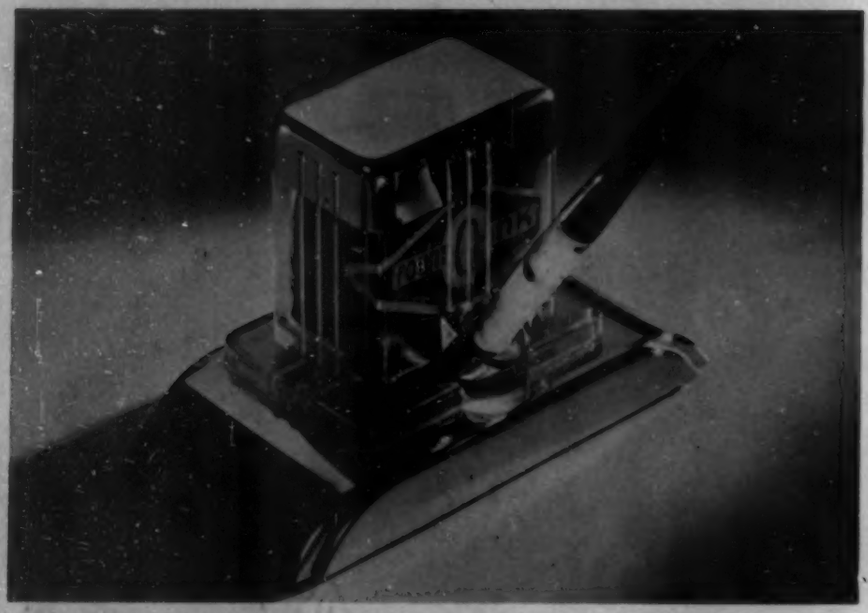


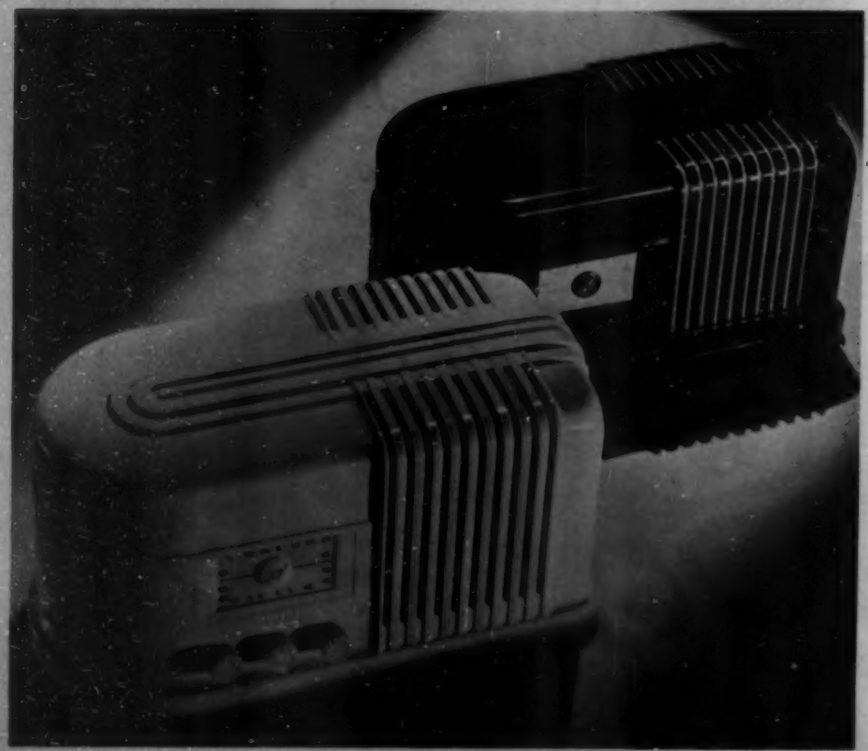
• To Shure Bros., Chicago, Ill., for their Model 99B Zephyr Crystal Record Reproducer. This application was designed by Wesley E. Sharer of Henry H. Teplitz Advertising Agency, Chicago and molded of Bakelite, a phenolic material made by the Bakelite Corp., New York City, by Chicago Molded Products Corp., Chicago, Ill. Plastics were used because of their light weight, beauty of design and because streamlining could be achieved with crisp edges contrasting against rounded surfaces.

• To the Unbreakable Lens Co. of America Inc., for Optical Lenses molded of Plexiglas, a methyl methacrylate material made by Röhm & Haas Co., in Philadelphia, Pa. The design and manufacturing technique were worked out by E. G. Lloyd of the Unbreakable Lens Co. These Opthalmic Lenses are made to perform all the functions of glass lenses and being unbreakable they give definite assurance against injury to the eyes from broken or splintering glass.



• To Sonotone Corp., Elmsford, N. Y., for its Sonotone Hearing Aid Storage Battery Charger, designed by J. W. Baum of the Engineering Dept. This entry was molded by General Industries, Elyria, Ohio, and Multi Products Tool & Die Company, Newark, N. J., from Bakelite, a phenolic compound made by the Bakelite Corp., New York City. The Sonotone Charger was designed for use in the home, is rugged, fool-proof, safe, good-looking equipment with a lasting finish.





DECORATIVE HONORABLE MENTION

• To Hurst, Inc., Boston, Mass., for Nesting Cup and Saucer produced from transparent phenolic molding powder made by the Catalin Corp., New York City. It was molded by Waterbury Button Co., Waterbury, Conn., designed by Alcott, Thoner & Marsh, Boston, Mass. It represents the introduction of a new transparent phenolic material for practical tableware, where light weight and resistance to rough handling is desired. Transparency in various colors may be achieved and compact nesting of the dishes recommends them to air craft, trailer and marine use

• To Gregory Ink Co., Los Angeles, Calif., for the Fount-O-Ink Writing Set. The plastics used are Lucite, a methyl methacrylate material manufactured by E. I. du Pont de Nemours & Co., Inc., Arlington, N. J., Tenite, a cellulose acetate material manufactured by Tennessee Eastman Corp., Kingsport, Tenn., and Durez, a phenolic material manufactured by General Plastics, Inc., North Tonawanda, New York. It was molded by the Remler Co., San Francisco, Calif., and designed by C. G. Gregory of the Gregory Ink Co.

• To Sears Roebuck & Co., Chicago, Ill., for Silvertone Radio designed by John R. Morgan, company designer. The materials used are Durez, a phenolic molding compound made by General Plastics, Inc., North Tonawanda, N. Y., and Beetle, a urea molding material made by Beetle Products Div., American Cyanamid Co., New York City. The chassis is made exclusively for Sears Roebuck & Co. by Colonial Radio Corp., Buffalo, N.Y. Cabinets are molded by American Insulator Corp., New Freedom, Pa.

HOUSEHOLD HONORABLE MENTION

• To Sears Roebuck & Co., Chicago, Ill., for Check-Weight Kitchen Scale. This Scale is made by John Chatillon & Sons, New York City, and is completely housed in a Bakelite shell, molded by Northern Industrial Chemical Co., Boston, Mass. The Check-Weight was designed by John R. Morgan of Sears Roebuck and Co., in simple tear drop form so that it is both easy to read and keep clean.

• To the Aluminum Cooking Utensil Co., New Kensington, Pa., for "Wear-Ever" Aluminum Tea Kettle, which was designed by the company organization. The practical, comfortable finger grip handle is molded of Bakelite, a phenolic material made by the Bakelite Corp., New York City, by Diemolding Corp., Canastota, N. Y. The grip is molded in two parts to facilitate ease of replacement for the purchaser or dealer should it become damaged or broken in use and the insulative qualities of molded phenolics prevent the handle from becoming too hot to touch.

• To Imperial Brass Mfg. Co., Chicago, Ill., for the Imperial Iced Rolling Pin, designed by Robert McIntosh, Chicago. The plastic used is the water resisting, black Bakelite made by the Bakelite Corp., New York City, and molded by Imperial Molded Products Corp., Chicago, Ill. The metal cylinder is designed to accommodate ice cubes or cracked ice in order that pastry may be rolled and kept cold so the yeast will not react until placed in the oven. Plastics were used to insulate the hands from the ice cold roller.

STYLE HONORABLE MENTION

• To D. Lisner & Co., New York City, for Novelty Costume Jewelry Set in Autumn Leaves design. The plastic material used is Marblette, a cast resin manufactured by the Marblette Corp., Long Island City, N. Y., and fabricated by Ace Plastic Novelty Corp., Brooklyn, N. Y. Fittings are attached with drive screws made by Parker-Kalon Corp., New York City. S. Braunstein was responsible for the design. The increasing popularity of costume jewelry with generous proportions makes this type of plastic an ideal material because of its light weight.

• To William Wilder, Inc., New York City, for Handbag with Plastic Frame. The plastic used is Celluloid, a cellulose nitrate material made by the Celluloid Corp., New York City, and fabricated to shape by Rex Products Corp., also of New York. The handbag was designed by William Wilder of William Wilder, Inc. Celluloid being a thermoplastic material, made it possible to fabricate this bag top from rod stock, with very little machining operation involved.

TENTER RAILS

by A. C. WHITTIER*

THE "INDUSTRIAL REVOLUTION" IN THE TEXtile industry, following the invention of the power loom, made its mark upon economic and social history. That was the beginning of the "machine age" in fabrics; since that time manufacturers have constantly sought improvements to make their machinery function more efficiently, increase production and cut down costs.

Thus, under modern conditions, industry as a whole has become a great, mutual-interest cooperative, each unit bent upon the creation of new products to cope with new requirements, adapting the materials made by man to replace, where they prove superior, the materials of nature. The results have been, as any observer can see, momentous ones.

Under such circumstances, phenolic laminated came to the textile industry. It has replaced hard maple that in ordinary instances lasted about six weeks. The laminated replacement has been in service intact for four years, permitting greater production speed and reducing a costly maintenance bill to nothing.

In the finishing of cloth the last major operation is "tentering." In this processing, the material is handled in long lengths and pulled from one operation to another through the plant. The cloth is stretched lengthwise, naturally decreasing the width, after which the tenter-frame resets the cloth to the desired width.

Several years ago the textile finishing industry was unusually hard put to increase production and decrease costs. One of the items considered was the tenter-frame. This frame consists of two almost parallel endless chains, made up of clips which seize the selvage of the moistened cloth at the entering end and carry it, under tension, to the leaving end of the tenter. In the old style or "open" frames, gas flames under the cloth supplied heat for drying and "setting" to the desired width. The speed in an open frame, varied with the type and weight of the cloth, but averaged only about thirty yards per minute.

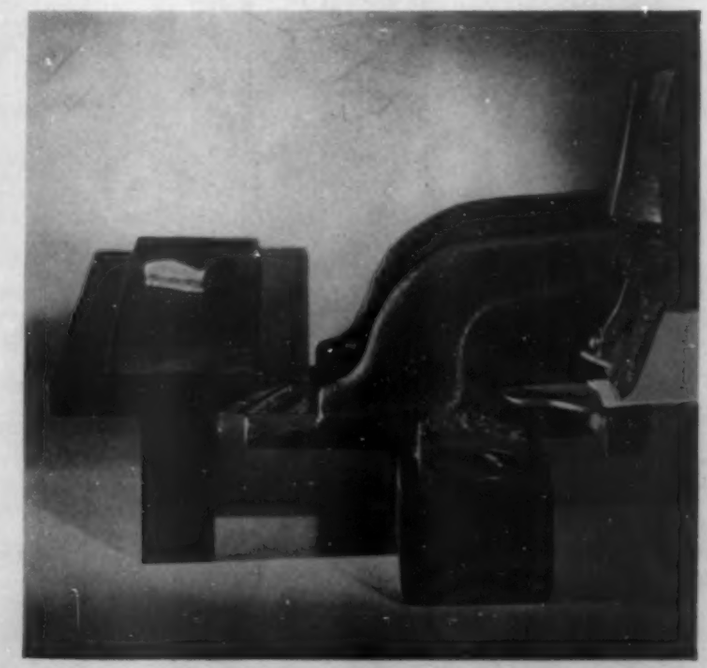
The tenter room was very generally a limiting factor in production. In order to step up production the tenter speed had to be increased. To accomplish this the drying effect was changed, which led finally to the installation of insulated housing around the tenter and the use of highly efficient heat exchangers and blower systems.

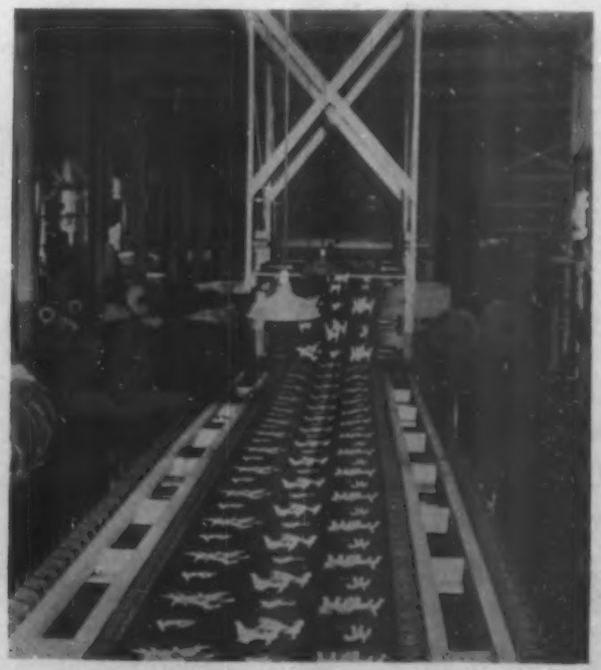
The tenter rails were ordinarily made from the best grade of hard maple. However, when the temperature in the enclosure was raised, the maple strips lasted only a short time—from three to six weeks—constituting a very serious maintenance problem, and loss of production. In the case of one finishing plant, the frame temperature in 1932 was 280 deg. F., and the maple rails lasted about six weeks. In an effort to reduce the maintenance charges the possibility of using Bakelite laminated was considered, and Grade A-701 was developed for use as tenter rails. One frame was equipped initially, and all others followed in five months. Of the necessary characteristics for tenter-rail stock, the two most important are the ability both to stand high temperatures continuously with minimum deterioration and to withstand wear of the sliding clips.

The use of this special laminated stock permitted raising the tenter-house temperature from 280 deg. F to 350 deg. F., with a proportional increase in cloth speed and production. In addition, maintenance on the frames has been reduced almost to the vanishing point, as the original A-701 strips are still in service after more than four years with a saving in time and money as well!

* Manager, Phenolite Division, National Vulcanized Fibre Company.

Left—When special laminated stock was adopted for tenter rails temperature could be raised from 280° F. to 350° F. with proportional increase in production. Right—Rails of phenolic laminated on this tenter frame are still in service after four years. Formerly hard maple rails lasted from three to six weeks

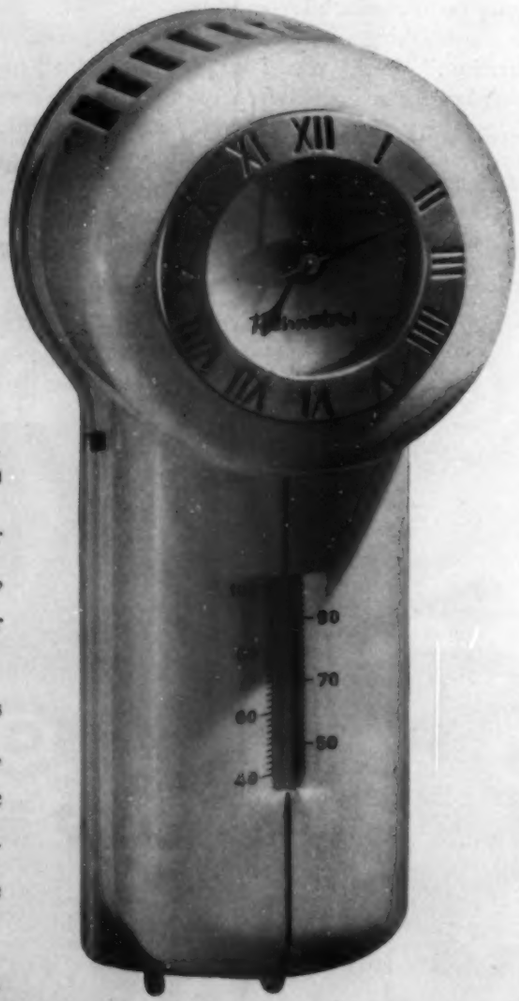




PLASKON

AYER "CAMPUS KIT"

'Off the arm on to the dressing table,' is the idea behind the Campus Kit which scored immediately with the board of women judges, was named a prize winner in this year's STYLE GROUP. The cosmetics are packaged in featherweight Plaskon caps and containers for appeal and extra protection. For a final individualistic touch, each Molded Color piece is engraved with the maker's name—Harriet Hubbard Ayer. Colt's Patent Firearms Mfg. Co. is the molder.



WHITE TECHNOTROL

"Beauty of clean line and texture, plus long life and durability, recommended Plaskon to me," says J. A. Reinecke, designer of White Manufacturing Company's prize winner in the SCIENTIFIC GROUP.

"I feel that this application of Plaskon's attractive colors and pleasing texture to an article for use in the home, marks another step in the progress of this versatile plastic material. Its inherent attractiveness, along with its durability, make it one of the designer's greatest aids in the achievement of eye-appeal."

Technotrol is molded by Chicago Molded Products Corp.

Prize Winners

Your product can look as well, wear as well, and sell as well as these Modern Plastics Competition Prize Winners.

It's no matter if your design is different . . . Plaskon has been the solution to hundreds of different and difficult designs. In many, many cases new manufacturing economies have resulted thru the adoption of this superior, uniform plastic.

In all cases, inherent advantages—like beautiful color, permanent finish, and great strength—have been incorporated.

The great selling appeal of Plaskon has made it the largest-selling molded color plastic in the world. Today, Plaskon is the selling identity color of many a nationally famous product.

Before you carry your plans further, let us send some sales results achieved with Molded Color.

"SERVET" SET Design for appearance was the most important consideration in awarding a prize to the "Servet" family line in the 1937 HOUSEHOLD GROUP. The judges, however, kept in mind the practical aspect of the application of plastics—exemplified in the use of colorful Plaskon trays for keeping heat away from the table top and for winning consumer acceptance. "Servet" dishes are used for both cooking and serving. Made by Steelsmiths, Inc. The Plaskon trays are molded by the Plastic Department of the General Electric Company.

PLASKON COMPANY
INCORPORATED
2121 SYLVAN AVENUE, TOLEDO, OHIO

BRITISH MOTOR CARS

BETWEEN VISITS TO AMERICAN MOLDERS SCATtered from New York to points West, L. J. B. Forbes, director of H. E. Ashdown Birmingham, Ltd., of St. Helens, England, found time to gratify our curiosity regarding the work his company is doing in the automotive field in England. With vague rumors floating about this country concerning an all-molded plastic automobile body, which practically every plastics man you meet has heard about but actually none has seen, we were particularly interested to learn how far plastics

have penetrated into the manufacture of automobiles in England. Our readers will be interested in the result.

Four automobile companies in England at the present time—Humber & Hillman, Standard Motor Company, Ford Motor Company and Morris Company are using plastics extensively in car interiors, with special emphasis on garnish moldings introduced and patented by Ashdown a little more than a year ago. These garnish moldings frame the glass in front and rear doors, quarter lights, back lights and screen pillars at either side of the windshield as well as dome lights which also usually have an urea shade. These largely replace steel previously used for the purpose and are considered superior for several reasons. For example, the plastic moldings are lighter in weight; they cost a bit less; there is no trouble about varnish scraping or paint chipping off which does happen with the best of paints; and the moldings can be made in irregular shapes which would be quite out of the question with steel moldings without considerable expense. Still another point which has given impetus to the use of plastics is the scarcity of steel in England at the moment.

All of these companies, with the exception of Standard Motor Co. prefer a walnut finish in imitation of wood; Standard uses plain black moldings which look infinitely better but are more likely to show defects. Ordinarily, the moldings must be given as much of a grain effect as can possibly be managed and since it is next to impossible to produce a longitudinal grain on the phenolic material, a special tool has been evolved which gives a cross grain effect.

The possibility of breakage in fitting these moldings or in actual usage is slight and when it does occur can be traced to a defective molding job or a definite case of bad handling. The moldings have considerable flexibility and can be racked about five inches out of the horizontal on both sides without breaking. Tests on the larger windows have shown them capable of sustaining a load of 90 pounds on the span on one side of the molding. Fitting strips on the back of the molding (a patented process) hold it in position in the window space where screws keep it securely in place.

The more elaborate garnish moldings are turned out at the rate of one thousand pairs a week on one press, working continuously for six days a week, although sometimes an intricate molding runs less. Standard general purpose material is used. Holes for screws are drilled after the molding operation with specially designed horizontal and vertical drills. It is not found feasible to mold the holes since the molding is done at an angle which might result in breakage. It is estimated that the present number of cars equipped and that will be equipped for the year will approximate between 3000 and 4000 cars a week for these four companies.

Aside from the garnish moldings, the usual array of plastic parts such as knobs, steering wheels, ash trays, glove compartment covers, switches for lights, etc., appear in cars of British manufacture; in fact, roughly ten pounds of plastic material are used per car on one of the smaller so-called popular models, and this would amount to considerably more if used equally lavishly on larger cars.

As for the future of plastics in this particular industry, it is only a question of time before their use will be extended to other parts of a car. Other possibilities that may be considered for molded plastics are the insides of doors, backs of front seats and possibly little tables attached to the back of front seats where such a convenience might be of value.

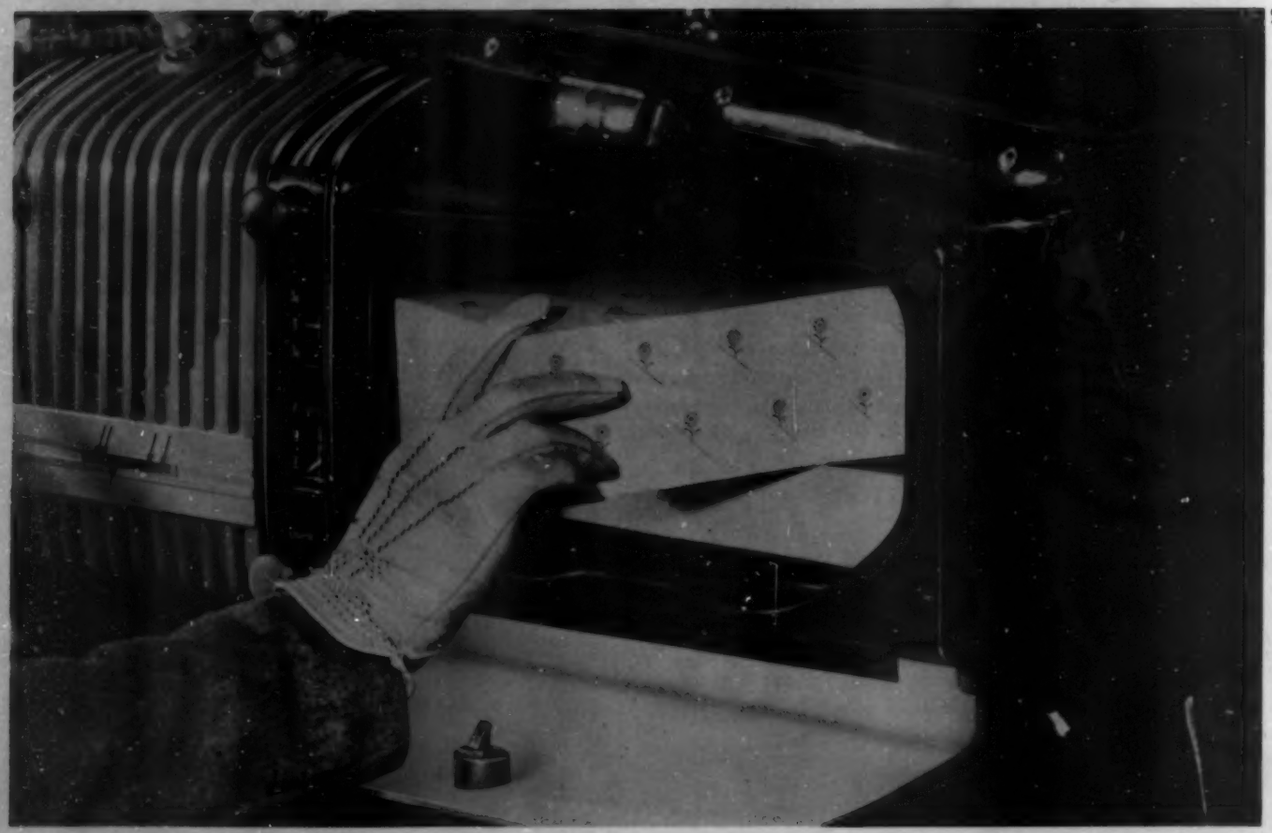
Practically all cars in England, except the very cheapest models, are equipped with sunshine roofs and eventually the frames for these might well be molded of plastic material. Undoubtedly this would require a fabric or paper laminated material to supply necessary strength because the racking of the body of the car would tend to break an ordinary molding. However, it is believed that a reinforced plastic frame would stand as much strain as steel. Another application might be the framing of moving lights in *(Please turn to page 98)*

Plastic "trim" is more prevalent in England than in America as may be seen in the Ford "10" 2-door model (above) and the 4-door model (below) on the opposite page in which door-window frames, windshield pillars, glove compartment, instrument panel and back light frames are molded. Door-window frames, quarter lights and back light frames in the 9 H.P. Standard Motor Company model (pictured at the right) are also molded

CELLULOSE ACETATE IN AMERICAN CARS

by SPENCER E. PALMER*

1



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THE MOST EXTENSIVE USE OF PLASTICS IN American motor car history was evident to those who viewed the 1938 models on display at the National Automobile Show. This year's show indicated that the motor car industry is fully aware of the tremendous possibilities offered by plastics for decorative and utilitarian purposes. The very name—plastic—seems to identify the product with this industry which must redesign and restyle annually—an industry that must choose a material so flexible in character as to give the effect of complete change year after year.

Cellulose acetate plastics in particular have been identified with the restyling of body interiors. This is largely due to the rapid injection molding process to which this type of plastic is adapted.

At least twenty-eight motor-car manufacturers, which represents practically the entire industry, have adopted these interior fittings this year. This includes seven cars of Canadian manufacture. Altogether 231 different fittings have been counted on the 1938 cars. These fall into the following classifications: steering wheels, horn buttons and retainer rings; window regulator, dash control and gear shift knobs; instrument board radio grille and cover plate panels; medallions, escutcheons, map light shades and bezels. Larger molded pieces are much more in evidence this year, showing the rapid progress of both injection and compression molding.

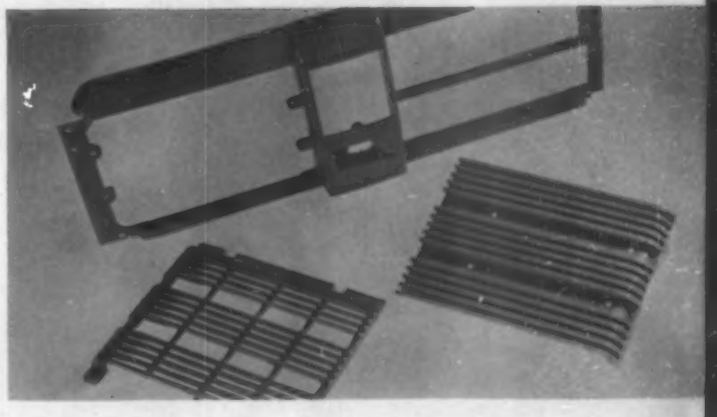
One of the largest molded fittings, and probably the most intricate, is the Cadillac radio grille instrument panel. Compression molded in three pieces, the larger piece or frame measures 6 by 17 inches and weighs 8 ounces. The two rectangular inserts are approximately 5 by 7 inches, weighing about 5 ounces each. It is molded of light, bluish-gray and when assembled has chromium bands across the two smaller insert panels, giving a very striking modern appearance. The openwork grille conceals a loud speaker while in other parts of the panel are incorporated an electric clock, a radio dial and an ashtray. It is exceptionally light in weight, yet has the strength and resilience characteristic of cellulose acetate plastic.

Another car making extensive use of cellulose acetate plastic on the instrument panel is the Hupmobile. It bears three large molded panel inserts in two tones of brown and beige set in a steel frame which is finished in grained walnut. The center panel insert is a vertical radio grille curved to conform to the shape of the instrument panel. The two side panels give the appearance of plaques, one around the speedometer and the other around an electric clock. The panel on the right side of the radio grille and the one incorporating the clock is also the door to (*Please turn to page 100*)

* Sales Manager Cellulose Products Division, Tennessee Eastman Corporation.

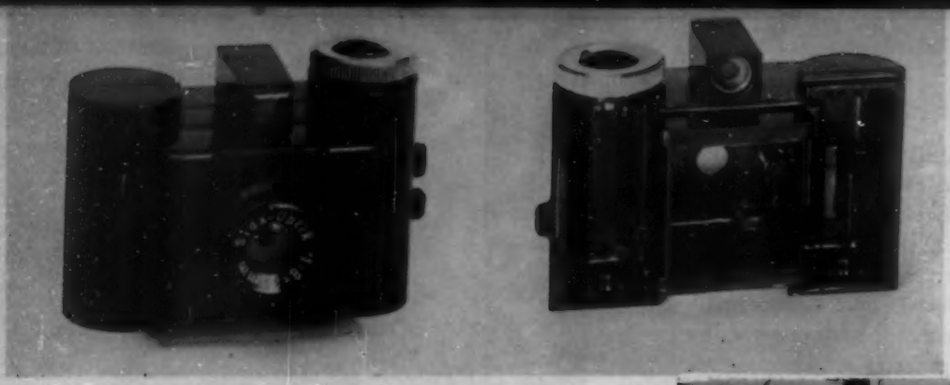
3

4



5

1, 2. Hupmobile, with its instrument panel and glove compartment door, has the largest installation of plastics ever made in an American automobile. 3. Buick fittings on 1938 models include steering wheels, control knobs, ash tray and map light covers. 4. Hupmobile has a new banjo type steering wheel to match instrument panel, while Cadillac (5) has an instrument panel radio grille and two inserts of intricate design. All these are Tenite



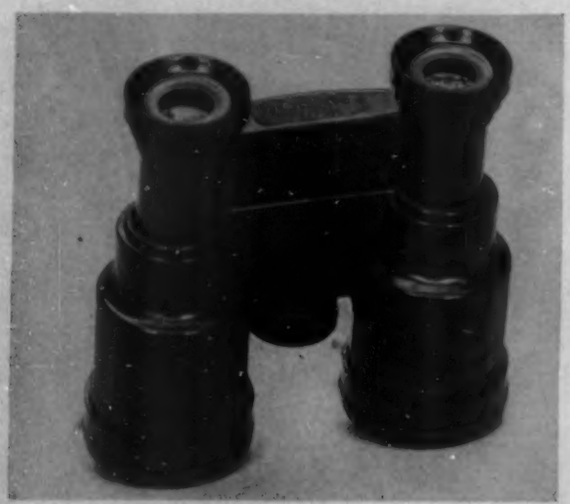
Even a casual examination of the Sida-Kamera, illustrated above, will reveal its clean, smooth lines, made possible by molding. Its technical behavior may be judged by the pictures it makes which are illustrated at the right, both actual sized and enlarged. The Isolan-Telescope has a completely molded case with a thumbnut for adjustment to any vision

THEY SELL WELL

by F. WIENER

The reason for the selling success of this little German camera is the happy combination of a good lens, a well designed case, and a popular price. The same holds true of the pocket sports glass.

TWO OPTICAL INSTRUMENTS WITH MOLDED cases were recently brought forth in Germany which gained rapid vogue and found great popularity. These results are not only due to the low price of 1.50 RM each, but above all to the good technical qualities of the apparatuses and their very low weight which is achieved through the use of a plastic material for the cases.



The Sida-Kamera, which is quite the smallest photographic camera in the world, was at first constructed with a case of cast iron; therefore the camera showed—compared with its small dimensions of $2^1/_2$ in. by 2 in. by $1^1/_2$ in.—the rather high weight of 7 ounces. This weight impeded the sale of such a small camera.

A new model with a molded case, but of the same dimensions and technical achievements, led to quick success from a selling point of view. The weight was reduced to $2^1/_2$ ounces including the film which permits it to be carried in a ladies' purse or in the jacket pocket with perfect comfort. It is well designed, following closely the lines of much more expensive equipment, and its lens gives amazing results as you can well see if you will look at the photographic original and enlargement below. Remember, some detail is lost in reproduction.

The camera works with a special film of 8 takings, producing a clear picture 1 by 1 inch. The case itself is an intricate molding job, perfectly light-tight and simple to use. The low selling price, of course, is possible only because production has been established upon a large scale and maintained over a period of some time.

Quite the same is true of the new Isolan-Telescope (shown at the left) which is also carefully made of molded phenolic material. It weighs not more than $3^1/_2$ ounces and may be comfortably carried in a handbag or jacket pocket. This apparatus, too, has a pretty good optic quality with spherically ground lenses effecting about two-fold magnification. For this reason it is especially suited for sports, theater, and the cinema.

It is quite impossible to travel about the countryside wherever sporting arrangements are in progress without seeing many of the little Sida-Kameras in action, and many of the Isolan-Telescopes being used.

STOCK MOLDS

SHEET FORTY-THREE

The items illustrated are available to the packaging and premium trade from stock molds. Containers with dual-use possibilities, suitable for jewel, cigaret and candy boxes are obtainable in almost any color without mold or engineering cost.

---

466. Hexagonal hinged candy box 2 11/32 in. deep by 5 1/16 in. top. Contents 2 lbs.

467. Fruit cake box 11 in. long by 3 13/32 in. wide by 2 1/2 in. deep inside. Contents 2 lbs.

468. Dual duty tumbler, cigaret holder or cup. Liquid capacity is 4 1/2 oz.

469. Small cigaret box 3 3/4 in. by 3 in. by 1 1/8 in. inside

470. Square box 3 3/4 in. by 3 3/8 in. by 1 3/16 in. inside

471. Rectangular box with decorative hinged cover. 5 1/4 in. by 3 5/16 in. by 1 5/8 in. inside

472. Hinged box 6 1/4 in. by 3 in. by 33/64 in. inside

473. Hinged cigaret box with engraved top, 6 1/4 in. by 3 3/32 in. by 1 29/32 in. inside

Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits.

STOCK MOLDS

SHEET FORTY-FOUR

These parts are available from stock molds. Inquirers should specify both sheet and item numbers when writing for samples.

---

427. Carriage knob with knurled sides 1/4 in. 1 1/2 inch stud

428. Carriage knob 5/16 in. bushing. Diameter at top 2 1/8 in.

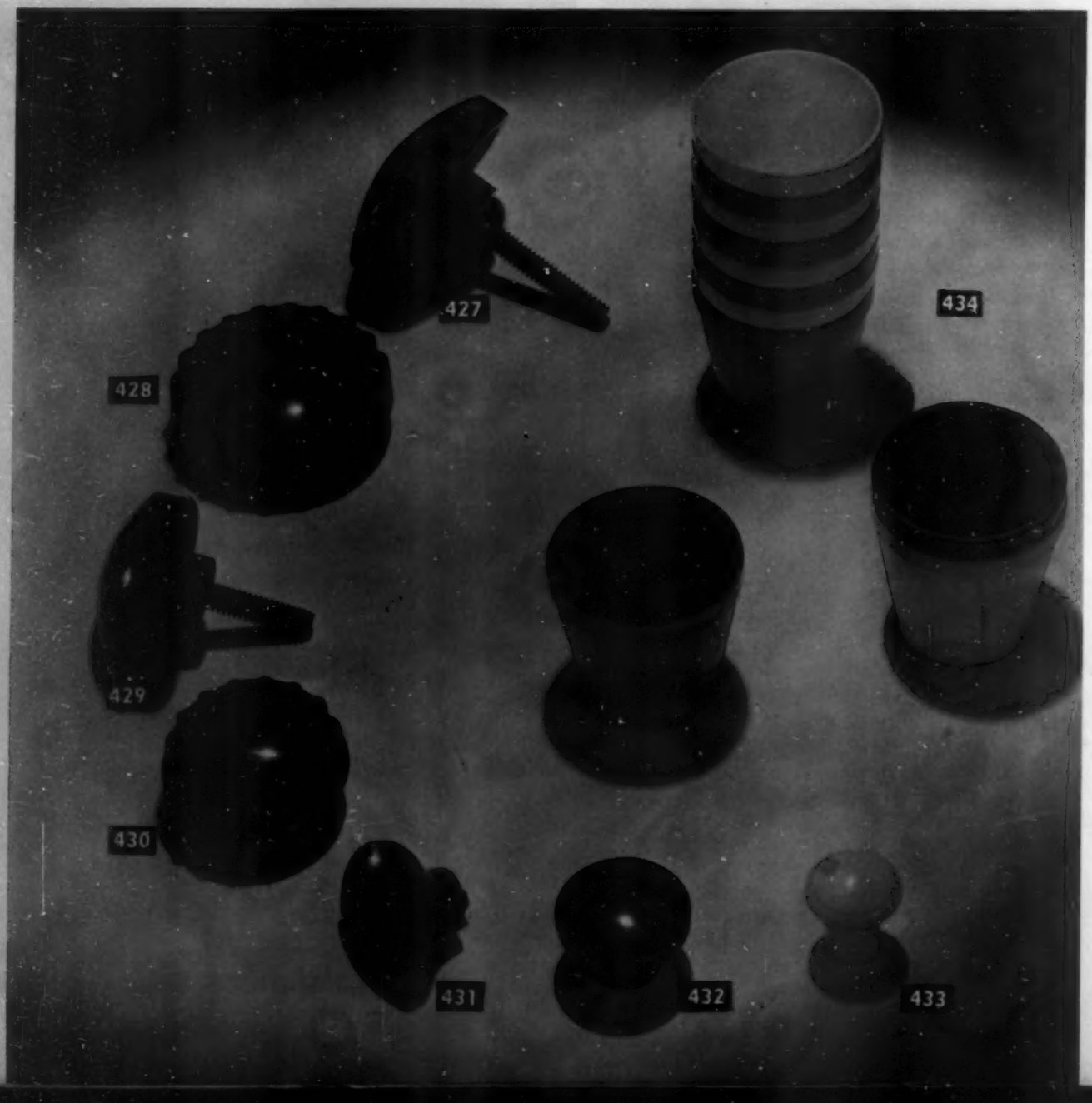
431. Tea kettle knob. 3/16 in. aluminum insert

432. Tea kettle knob with bushing. Diameter at opening 3/16 in.

433. Tea kettle knob with bushing. 1/8 in. diameter at opening

434. Nest of "jiggers" in red and white. Diameter is 1 1/2 in. and has 1 oz. liquid capacity

Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits.



TECHNICAL SECTION

MOLDS FOR PHENOL RESINOIDS

by T. E. CASSEY

INTRODUCTION: THE NAVY DEPARTMENT HAS been rapidly increasing in recent years the number of molded parts used on naval vessels and has accumulated considerable information on the construction of molds for the production of meter cases, electrical fittings, gage enclosures, clock housings and similar articles. Molds are required which can be used repeatedly and in different plants, and one hastily built for the production of a limited number of parts will not serve. Resort must be had to a standardized, rugged and high-grade product which has been built for a "long haul." In a series of articles, beginning in this issue, Mr. T. E. Cassey, Chief Electrical Draftsman of the Bureau of Engineering, Navy Department, deals with the variations in types of molds which appear to be necessary today, together with little tricks of design detail which have been noted as a result of a wide experience in purchase. We are indebted to the editorial board of the American Society of Naval Engineers for permission to reprint this material from the August 1937 issue of their journal. (G. M. K.)

A COMPLETE CLASSIFICATION OF THE PRINCIples involved in the construction and operation of molds for phenolic resinoids is given as follows:

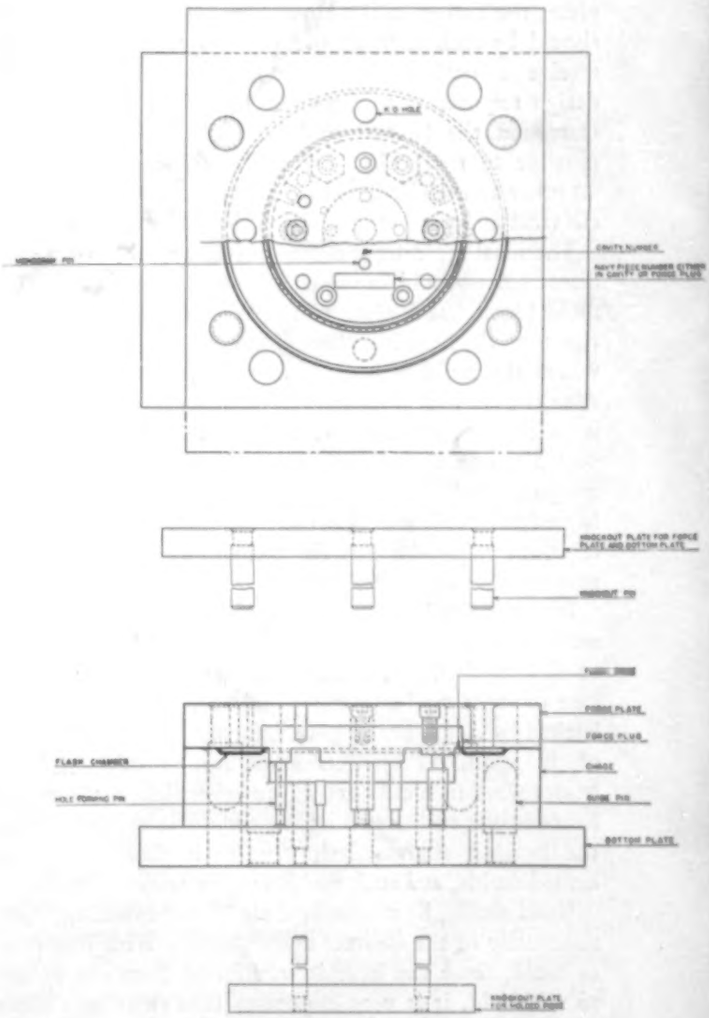
Construction: Unit, Built up, Split follower, Ring follower, Split cavity, Floating chase; *Heat Transfer:* Direct, Indirect; *Method of Handling:* Hand, Semiautomatic; *Number of Cavities:* Single, Multiple; *Physical Action:* Flash, Positive, Extrusion; *Loading:* Cavity, Filler plate; *Closure*: Complete, Spacer fork, Spacer fork with spring box; *Ejecting:* Knockout plate, Stripper plate, Automatic; *Raw Material:* Bulk, Preform.

In elaboration of the above we will first consider the principles under the term "Construction." As an explanation of these classifications involves mention of that part of the mold known as the "chase," it is well to define this piece at the outset as the "central member of the mold which bears the molding cavity or cavities." (See Figure 1).

The mold cavity, sometimes called the "die," is that part of the chase in which the molded piece is formed. The cavity or cavities are either cut directly into the chase or formed within a plug or plugs which in turn are fitted in the chase.

Where the cavity or cavities are cut directly in the chase itself, the mold is termed a "unit construction" mold, and when formed by the use of separate plugs, fitted in the chase, the mold is called a "built up construction" mold.

The built up construction mold may be of several different forms. In one form the cavity is machined in a cylindrical plug and the plug fitted tightly into a recess cut in the chase to receive it. In the second form, probably the most common, a through hole is cut in the chase of the size and shape of the molded piece;



UNIT CONSTRUCTION, INDIRECT HEATED, HAND, SINGLE CAVITY, FLASH OVERFLOW, CAVITY LOADED, COMPLETE CLOSURE, KNOCKOUT PLATE EJECTING MOLD

FIG. 1

a bottom plug is fitted in this hole flush with the bottom of the chase, forming the bottom of the cavity. The third form is the split follower type wherein the separate cavity plug or plugs are made in two or more pieces. This type of mold is designed for molding of pieces having undercuts or projections, which would make their removal from the simple "solid cavity" mold impossible. Another form is the ring follower mold, used generally in the case of circular pieces having molded threads, to permit these pieces being ejected from the mold. The split cavity and floating chase types of mold will be considered later.

Heat transfer

With respect to heat transfer, the second classification, molds may be classified as Indirect Heated and Direct Heated.

When molds are heated by being placed between hot press platens, they are indirectly heated. When the mold itself is channeled for steam and water circulation, and provided with suitable piping connections therefore, it is considered as directly heated.

The application of heat to the mold is of great importance. In order to insure uniform curing of the piece, the design of the mold in so far as is practicable should be such that all parts of the mold cavity will receive a uniform heat. Commensurate with other design requirements, the mold should be of minimum mass and the heat should be applied as directly as possible to the mold. Where steam heating is used, no other accessories for heating, such as electric heating elements and gas burners, should be utilized.

The ideal mold from the standpoint of heating is the direct heated mold in which the steam circulates in the mold block itself, close to the cavities. In a mold of this type the heat loss through radiation is far less than where the mold is heated from contact with platens. Also the transfer of heat units to the phenolic material is quicker and more efficient for there is a short direct path through the metal. Care should be taken in this design of mold to see that all parts of the mold will be heated uniformly and that there will be sufficient volume of steam going through the mold to supply the proper amount of heat.

Direct heated molds are confined to those of the semi-automatic type and are usually press mounted due to the required steam and water connections. In the case of some semi-automatic molds, where the dies are backed by steam heater-plates, forming an integral part of the mold, the application of heat is indirect, from heater-plate to mold cavity; however, inasmuch as the heat-transfer surfaces remain in their original condition, the heating characteristics approach those of direct heated molds, and such molds may be so considered.

Hand molds, by reason of their "hand handling," are necessarily of the indirect heated type. With this type of mold, since the heat is transferred from the platen to the mold, it is very important that there be a close contact between the mold and the platen. In order to keep the heat losses to a minimum, it is important that the outside surfaces of platens and molds be kept smooth and clean. Platens dented and containing spots of cured material cause a poor contact and greatly increase the heat loss. These platens often become partly clogged from scale and sediment deposited and consequently cut down on the volume of the steam flow. They should frequently be checked and cleaned or replaced when necessary. Hand molds tend to cool off considerably while they are out of the press and it is essential that they be replaced in the press as quickly as possible to avoid too great a loss of heat. For the most efficient operation it is good practice to keep them on an auxiliary hot platen while they are being loaded.

Method of handling

With respect to the Method of Handling (loading and pulling), the third classification, molds may be classified as Hand or Semi-automatic.

Hand molds may be defined as those molds which are moved in and out of the press manually by the operator. Loading the mold charge and placing the inserts is done on the bench. The opening of the mold and ejection of the piece is accomplished in a separate stripping press, or on a bench.

Weight and size are the deciding factors in the use of hand molds. A maximum weight of 100 pounds and a size limitation of 16 in. by 16 in. may be generally accepted as workable limits for good hand mold operation.

When the mold mass is such as to offer difficulties in "hand" handling, chain falls, slides or other means as desired by the manufacturer are used. In such cases, however, the use of the hand mold in comparison with the semi-automatic mold, where increased difficulties in handling are involved, resolves itself into a question of economic production.

In general, hand molds are to be preferred for the production of Navy designs of molded parts in spite of the advantages which semi-automatic molds may hold for high speed and quantity production in commercial industry. Hand molds have advantages of simplicity and low cost, they offer greater facility in placing inserts, and greater economy of maintenance. Hand molds are also more suitable for a relatively small and periodic production, and moreover, provide a wider measure of competition for Navy orders, as molders can make use of hand molds without alterations to their existing plant equipment. Hand molds, furthermore, lend themselves to greater ease in shipment to and from the custodian Navy Yard.

As compared to these advantages, hand molds have the disadvantages of low rate of production, high operating cost and of poor economy due to indirect heating. In addition, the size of hand molds is limited by weight considerations, as previously stated.

Semi-automatic molds are defined as those molds which are rigidly attached to the molding press. Loading is done with the mold in position and the pieces are automatically ejected when the press opens. With this type of equipment, the speed of the molding cycle depends largely upon the plas- (*Please turn to page 96*)

STUDY OF TRANSPARENT PLASTICS FOR USE ON AIRCRAFT

by BENJAMIN M. AXILROD and GORDON M. KLINE

It was reported in the January 1936 issue of MODERN PLASTICS that the National Advisory Committee for Aeronautics had established a project at the National Bureau of Standards to study the various synthetic resins and cellulose plastics with reference to their use as aircraft windshields. A discussion of some of the results obtained in the preliminary phase of this investigation was presented in the January 1937 MODERN PLASTICS. A detailed progress report of this work has just been released as Research Paper 1031 in the October issue of the Journal of Research of the National Bureau of Standards. The following information has been abstracted from this report. Copies of Research Paper 1031 will shortly be available from the Superintendent of Documents, Washington, D. C., for 15 cents.

VARIOUS TRANSPARENT ORGANIC PLASTICS, including both commercially available and experimental materials, were examined to determine their suitability for use as flexible windshields on aircraft. The properties studied include light transmission, haziness, distortion of vision, resistance to weathering, scratch resistance, indentation hardness, impact strength, dimensional stability, resistance to water and various cleaning fluids, bursting strength at normal and low temperatures, and flammability.

Cellulose acetate plastic was found to have excellent impact strength, bursting strength and flexibility, but the commercial products tested varied considerably in resistance to weathering and were all subject to marked shrinkage in 1 year's time. The shrinkage produces warping and sets up strains in the plastic sheets, which cause them to craze and crack. These strains are believed to be the cause of the spontaneous cracking of cellulose acetate windshields after they have been in service for 6 months or longer. This is particularly true of windshields exposed to low temperatures, as by ascent to high altitudes, thereby introducing additional strains in the windshield because of thermal contraction. A great deal of variation was observed in the weathering resistance between cellulose acetate sheets received from different manufacturers, and also between different lots of the material from the same manufacturer.

The acrylate resin plastic was found to be remarkably transparent, more stable to light and weathering and more resistant to scratching than cellulose acetate, but its impact strength and flexibility are much poorer. Surface crazing of the acrylate resins was noted after 1 year's exposure on the roof and also after storage for a similar period. It is claimed, however, that a method of processing has been developed which eliminates this tendency to craze. Further tests on modified samples of both cellulose acetate and acrylate resins are in progress to determine whether more uniformly durable products than have been on the market to date can be made available to the aircraft industry.

Resistance to weathering

Specimens of transparent plastics 7 by 7 inches were prepared for weather-exposure tests by fastening them in brass frames curved cylindrically to a radius of 5 inches. Most of the materials were flexible enough to bend to the curvature of the frame without special heat treatment and could be drilled in the flexed position without cracks forming at the holes. Two samples of the acrylate resin sheets, *J2* and *K1*, were softened in water warmed to about 60° C for 15 minutes and then bent and drilled. Another acrylate sample, *K3*, was softened by heating for 10 minutes at 70° C in an oven. One manufacturer of these resinous sheets has recently recommended bending them by warming at 90 to 125° C, depending on the thickness, using as the heating medium either water or preferably, hot air, pressing the sheet around a wood or metal form covered with rubber or glove cloth, and allowing it to cool in the bent position. Determinations of initial white light transmission and haze were made on the specimens in the frames before placing them on the roof. The frames were fastened to exposure racks on the roof of the Industrial

Building of the National Bureau of Standards, the racks facing south and being inclined at an angle of 45° to the horizontal. The tests were started on the roof during March 1936, and the changes in clarity after 1, 2, 3, 6, 9, and 12 months were determined quantitatively. The specimens were cleaned with lens paper soaked in tap water and for some of the materials in kerosene, prior to each measurement of their clarity.

The data for light transmission and haze made on the transparent plastics are given in Tables 5 and 7.

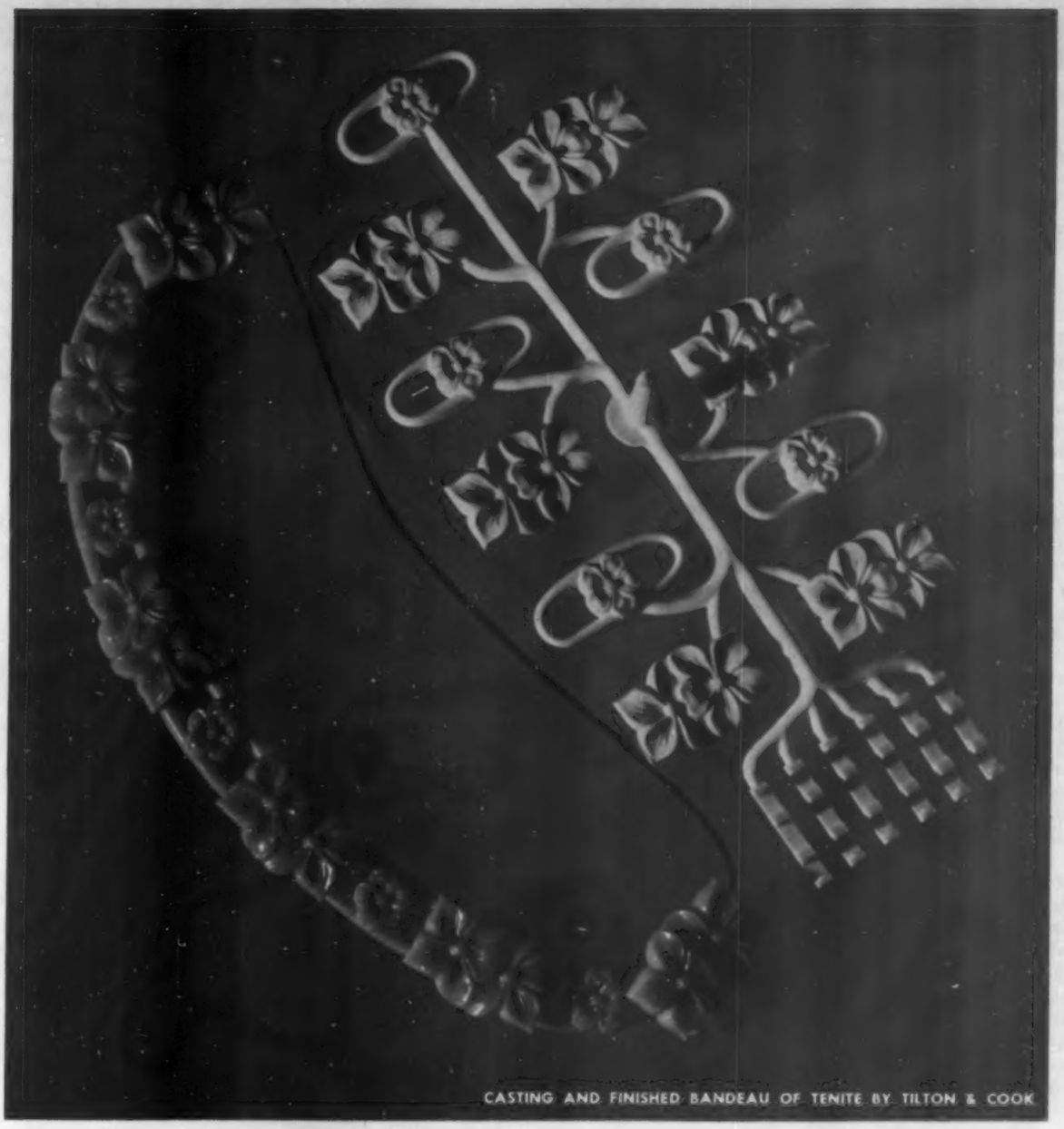
Table 5—Effect of outside exposure on white light transmission

Material	Sample	Light Transmission					Remarks on Condition at Last Test Period
		Initial	3 Months	6 Months	9 Months	12 Months	
		Percent	*Percent*	*Percent*	*Percent*	*Percent*	
Cellulose acetate	*A1*	88.2	90.6	83.4	85.5	77.1	Crazed; discolored.
Do	*A2*	85.2	88.2	81.7	81.2	71.1	Do.
Do	*A3*	82.2	86.4	84.9	83.5	72.9	Do.
Do	*B1*	90.8	91.6	91.2	91.3	91.3	Surface roughened; cracked.
Do	*B2*	89.9	90.7	90.5	90.7	90.7	Do.
Do	*B3*	90.7	90.7	90.5	90.4	88.8	Crazed.
Do	*C1*	87.1	87.6	88.7	89.2	89.3	Pebbled; crazed at edge.
Do	*C2*	81.1	83.1	83.5	84.7	84.6	Do.
Do	*D1*	76.6	87.9	86.7	80.9	57.4	Crazed and cracked.
Cellulose acetobutyrate	*S1*	92.0	92.2	92.2	92.1	92.2	Unchanged.
Cellulose nitrate	*E1*	91.0	84.8	43.2	37.0	35.1	Surface crazed; opaque.
Do	*F1*	83.7	79.1	39.0	34.2	32.2	Do.
Ethylcellulose	*G1*	79.7	51.8	....	....	....	Opaque; cracked.
Do	*H1*	85.3	86.2	....	....	....	Cracked loose from frame at 6 months.
Do	*I1*	90.3	89.8	60.2	24.0	....	Opaque; friable.
Acrylate resin	*J1*	92.9	92.7	92.9	92.6	92.3	Roughened; crazed.
Do	*J2*	93.2	93.0	93.1	92.8	92.6	Crazed.
Do	*K1*	93.3	92.7	91.7	91.7	91.4	Slightly discolored.
Do	*K2*	93.2	93.7	93.6	93.5	93.1	Roughened; crazed.
Do	*K3*	93.5	93.5	93.3	92.6	....	Slight crazing.
Vinyl chloride-acetate resin	*L1*	81.6	77.4	30.0	33.4	36.0	Discolored; crazed.
Do	*L2*	78.9	70.2	4.1	3.9	4.4	Discolored; opaque.
Vinyl acetal resin	*M1*	88.0	87.1	78.7	57.1	52.3	Crazed; opaque.
Do	*N1*	84.3	69.4	53.6	43.8	....	Do.
Glyceryl-phthalate resin	*O1*	85.5	....	82.8	82.4	....	Slightly discolored.

Table 7—Effect of outside exposure on haziness of transparent plastics

Material	Sample	Haze Value				
		Initial	3 Months	6 Months	9 Months	12 Months
		Percent	*Percent*	*Percent*	*Percent*	*Percent*
Cellulose acetate	*A1*	4.1	4.7	14.4	24.1	38.5
Do	*A2*	6.0	6.9	14.5	21.4	30.8
Do	*A3*	7.7	7.5	11.5	20.6	24.3
Do	*B1*	6.7	7.5	8.3	8.3	9.3
Do	*B2*	4.7	5.0	7.2	7.9	7.9
Do	*B3*	3.6	3.8	5.1	6.4	10.0
Do	*C1*	6.4	7.5	11.5	10.4	11.3
Do	*C2*	9.4	9.7	12.2	11.9	12.5
Do	*D1*	7.2	11.8	16.5	33.0	56.4
Cellulose acetobutyrate	*S1*	5.4	4.7	4.6	4.6	6.0
Cellulose nitrate	*E1*	3.2	7.8	83.8	96	97
Do	*F1*	4.2	7.5	84.8	97	98
Ethylcellulose	*G1*	26.0	78.8	....	....	....
Do	*H1*	9.0	17.0	....	....	....
Do	*I1*	5.8	7.2	86.3	99	....
Acrylate resin	*J1*	4.4	4.7	5.3	5.3	5.2
Do	*J2*	3.5	4.5	4.8	4.7	4.4
Do	*K1*	2.7	2.8	2.5	3.2	3.7
Do	*K2*	2.6	3.2	3.4	3.1	3.8
Do	*K3*	1.3	1.7	2.8	4.0	....
Vinyl chloride-acetate resin	*L1*	6.3	7.2	11.1	18.2	25.9
Do	*L2*	10.6	15.0	38	55	64
Vinyl acetal resin	*M1*	3.2	10.3	74	95	96
Do	*N1*	8.4	27.8	90	94	....
Glyceryl-phthalate resin	*O1*	7.7	....	9.4	10.0	....

(*Please turn to page 90*)



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PLASTICS DIGEST

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastic materials or use them

General

PLASTIC MATERIALS AND THEIR PLACE IN THE NATIONAL ECONOMY. Gydé. Rev. Gén. Mat. Plastiques Suppl. *13*, 215–19 (July-Aug. 1937). The organized efforts of Germany, England, and Italy to promote the utilization of domestically produced plastic materials wherever possible are reviewed. In this connection the data on the production of iron ore in various countries in 1934 are enlightening: France 32 millions of tons, United States 30.97, U. S. S. R. 21.7, England 10.75, Sweden 5.25, Germany 4.21, and Italy 0.48. But 30 of the 32 million tons of ore produced in France came from the Lorraine district. The author believes it advisable, therefore, to consider a program of expansion of the use of plastics in France. He divides his survey into discussions of the French plastics industry today, the domestic sources of raw materials, possibility of replacing imported industrial materials with plastics and utilization of colonial products. Mention is made of the experiments in Germany on the adapration of plastics to the construction of aircraft, railroad cars and automobiles. Not complete in this one issue.

ADVANCES MADE IN THE MANUFACTURE OF WOOD CELLULOSE. R. S. Hatch. Paper Trade J. *105*, 28–9 (July 22, 1937). Wood pulp is used for viscose rayon and cellophane manufacture, but cotton is the preferred material for acetate rayon and cellulose palstics. The author indicates that considerable work is underway to produce a wood pulp of high alpha cellulose content and of a physical form which will acetylate readily.

Materials and manufacture

NEW INSULATING MATERIAL: RUBBONE. Electrical Rev. (London) *121*, 147–8 (July 30, 1937). Research of the Rubber Growers' Association has developed a viscous gum by the catalytic oxidation of rubber. "Rubbone B" contains approximately 10 percent oxygen and corresponds roughly to $C_{20}H_{16}O$. In the presence of air, heat transforms Rubbone B to a hard brittle resin. Moldings with woodflour filler showed poor mechanical strength and only average dielectric properties, but possessed excellent antitracking characteristics. Experiments indicated its suitability for use in baking varnishes for application to paper and boards.

TRANSPARENT PLASTICS. Plastics (London) *2*, 126 (Sept. 1937). Previous attempts to produce transparent urea-formaldehyde moldings had resulted in an unstable product, liable to craze badly. Examples are shown of transparent aminoplastic moldings which, when properly cured, are said to withstand successfully all normal conditions of use.

ACRYLIC RESINS FIND INDUSTRIAL APPLICATIONS. D. S. Frederick. Chem. and Met. Eng. *44*, 468–71 (Sept. 1937). The properties of acrylic resins and their applications as airplane windshields, plastic for laminated glass, optical lenses, edge-lighted signs and instrument panels, and miscellanoues articles are discussed. Their use as protective coatings, impregnating agents and thermoplastic binders are also considered. Cf. MODERN PLASTICS of Oct. 1936 and Oct. 1937.

Molds and molding

INJECTION MOLDING IN U. S. A. H. Chase. Brit. Plastics *9*, 179–80, 211 (Sept. 1937). A discussion of nine injection molding presses in use at the Erie Resistor Corporation and the types of products molded.

Applications

LINING FOOD CARS WITH SYNTHETIC RESIN. Plastics (London) *1*, 144–5 (Sept. 1937). The Lithgow Corporation of Chicago has developed a method of treating tank car interiors with a phenol-formaldehyde resin so as to give a hard, flexible, non-chipping, glass-like surface. Adaptability of the special baking method (heated air) makes installations possible in almost any type of processing, storage, or transportation equipment without movement from its permanent location or interference with plant operation. Corrosion resistance and ease of sterilization are important factors in extending its use to the transportation of many products of industry, including alcohol, hydrochloric acid, dairy goods, lacquers and thinners, and various oils.

PAPER MILLS SAVE WITH LAMINATED PLASTICS. F. P. Mattison and C. E. Center. Paper Industry *19*, 555–7 (Aug. 1937). The use of laminated resinous material in the form of doctor blades, gears, and bearings in a mill of the Oxford Paper Company is described. Many suggestions are made as to sizes, clearances, temperatures of operation, lubrication, and so forth. Savings are indicated in maintenance, lubrication and replacement.

THE PRESERVATION OF BIOLOGICAL SPECIMENS BY MEANS OF TRANSPARENT PLASTICS. J. H. Hibben. Science *86*, 247–8 (Sept. 10, 1937). Same title. H. G. Knight. Science *86*, 333–4 (Oct. 8, 1937). The technic of preserving specimens by immersing them in methacrylate ester monomer and polymerizing same is outlined.

RECENT PROGRESS IN THE USE OF SYNTHETIC PLASTICS IN ENGINEERING. Engineering (London) *144*, 144–6 (Aug. 6, 1937). The applications of plastics as gears, bearings, and electrical insulators are considered. Synthetic resin varnish for the coating of paper and fabric insulation and for coating wire directly are well known. Tubes of synthetic material are used on core-type transformers up to 500,000 volts and for the segments inserted between the coils in the rotors of turbo-alternators.

SYNTHETIC PRODUCTS AS ADHESIVES. F. Ohl. Gelatine, Leim, Klebstoffe *7*, 35–43 (1937). Cf. Chem. Abstr. *31*, 5896 (Aug. 20, 1937). Cellulose derivatives are the oldest of the synthetic adhesives and now form the basis of several universal cements. The development of phenol adhesives in film form permitted a marked advance in production of water-resistant plywood. Liquid urea resins that can be used in either "hot press" or "cold press" gluing are now available.

DEFYING CORROSION IN THE TEXTILE INDUSTRY. J. K. Johnston. Rayon *18*, 515 (Aug. 1937). The use of plastics in textile equipment is described.

Chemistry

GELATINIZING ACTION OF SOLVENTS. L. Brissand. Rev. Gén. Mat. Plastiques *13*, 227–30 (July-Aug. 1937). The effect of aqueous and alcoholic (57%) solutions of various mineral salts on cellulose acetate is discussed. Thirty percent solutions of KI, CaI, NH_4SCN, KSCN, $Ca(NO_3)_2$, and $Ni(NO_3)_2$ dispersed the secondary acetyl derivative.

CONDENSATION OF PHENOLS WITH FORMALDEHYDE. III. DIRECT RESINIFICATION. F. S. Granger. Ind. and Eng. Chem. *29*, 1125–9 (Oct. 1937). In the condensation of phenol with formaldehyde industrially the intermediate formation of phenol alcohols is followed without interruption by their conversion to resinous products. The contrasting characteristics of alkaline and acid condensations of mixtures of molar ratios of phenol and formaldehyde are discussed.

THE STRUCTURE OF HEATED RESINOUS FILMS. H. L. Bender. Ind. and Eng. Chem. *29*, 1130–4 (Oct. 1937). Cf. abstract in MODERN PLASTICS of May 1937, page 59.

Synthetic coatings

MODERN TRENDS IN SYNTHETIC RESINS. R. G. Upson. Nat'l Paint Bulletin 1, 10–11, 18 (May 1937). Advantages claimed for synthetics over cellulose nitrate lacquers are increased flexibility and exterior durability, decreased explosion and fire hazard, thicker film for a given viscosity, better gloss retention, better adhesion to metals without the use of primers or surfacers, toughness of film and unusual resistance to abrasion, ease of application, and percentage of pigment by volume has little effect upon durability. Disadvantages cited are inability to rub down with compounds to give a rich appearance, difficulty of obtaining a film lacking orange-peel when applied by a spray gun, difficulty of touching-up damaged local parts, inability to adhere to wood unless thoroughly seasoned and slower drying time than lacquers.

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U. S. PLASTICS PATENTS

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COATING. John D. Murray (to Murray Liquafilm Corp.). U. S. 2,090,140, Aug. 17. A coating composition containing a cellulose ester or ether, blown linseed and tung oils and chlorinated rubber.

INSOLE BINDER. Jas. J. Clifford (to Stedfast Rubber Co., Inc.). U. S. 2,090,410, Aug. 17. Binding tape for the edge of insoles in shoes is made of a layer of rubberized fabric covered with a layer of pyroxylin and cemented to the insole with a thin layer of gutta percha, applied with heat.

TRANSPARENT PLASTICS. Max Landecker (to Pfenning-Schumacher-Werke G. m. b. H.). U. S. 2,090,452, Aug. 17. Casein can be incorporated in transparent urea-aldehyde resins without sacrificing transparency if the casein is first freed from fat.

MOLDED ARTICLES. Arthur Sommerfeld. U. S. 2,090,489, Aug. 17. An improved hot press method for molding heat-hardenable resins.

BATTERY BOX. Edw. R. Dillehay (to Richardson Co.). U. S. 2,090,577, Aug. 17. Molding battery boxes from a composition of not over 40% glass wool, at least 10% acid resisting absorbent clay and an asphalt binder.

PLASTIC CLEANER. August J. Stahl (to Standard Oil Development Co.). U. S. 2,090,577, Aug. 17. A nonhardening plastic cleaner which can be kneaded in the hand is made of polymerized isobutylene and an inert filler.

CELLULOSE GLYCOL ETHER. Geo. A. Richter (to Brown Co.). U. S. 2,090,808, Aug. 24. Etherifying cellulose fibers with ethylene oxide, grinding, washing with aqueous acid and dissolving in aqueous alkali.

CELLULOSE ACETATE. Geo. A. Richter (to Brown Co.). U. S. 2,090,809, Aug. 24. Acetylating cellulose or wood pulp by treating with a solution of sulphuric acid in a volatile solvent, allowing the solvent to evaporate and leave a residue of sulphuric acid on the fiber and acetylating.

CHLORINATED RUBBER. L. Rosenthal and R. Hebermehl (to I. G. Farbenindustrie A.-G.). U. S. 2,090,901, Aug. 24. Dissolving chlorinated rubber in an aliphatic or hydroaromatic hydrocarbon (which is ordinarily a nonsolvent) and a lower aliphatic ester or ketone.

MOLDED ARTICLES. Fritz Seebach (to Bakelite Corp.). U. S. 2,091,164, Aug. 24. Heating a hardenable phenol resin with tung oil in a mutual solvent, removing the solvent and molding, then hardening the product by heat.

TREATING PAPER. Paul La F. Magill (to E. I. du Pont de Nemours and Co.). U. S. 2,091,180, Aug. 24. Treating paper with a homogeneous blend of paraffin wax and a dihydronaphthalene resin polymer.

SAFETY GLASS. O. Röhm and Walter Bauer (to Röhm & Haas Co.). U. S. 2,091,615, Aug. 31. Uniting two glass plates with a marginal strip of polymerized acrylate or methacrylate ester, filling the space between the plates with a like ester and polymerizing by heat.

TABLE TENNIS BALL. Daniel C. Mabee. U. S. 2,091,684, Aug. 31. Making table tennis balls of thin flexible celluloid in sections joined by a reinforcing seam.

CELLULOSE ESTER SHEETING. E. R. Taylor (to Eastman Kodak Co.). U. S. 2,091,694, Aug. 31. Translucent sheet material with a matte surface is made from cellulose mixed esters, e. g., cellulose acetate butyrate.

CHLORINATED RUBBER. John M. Peterson (to Hercules Powder Co.). U. S. 2,091,878, Aug. 31. Stabilizing chlorinated rubber, rubber hydrochloride and chlorinated rubber hydrochloride by careful heating above 100° C. but not quite up to the decomposition temperature.

PHENOL RESIN ESTER. Oscar A. Cherry (to Glidden Co.). U. S. 2,091,965, Sept. 7. Esterifying a phenol-formaldehyde resin with a carboxylic acid boiling above 200° C. in presence of a lower-boiling acid anhydride, so that the lower-boiling acid is removed while the other reactants remain in the system.

FAST DRYING INK. Edw. M. Davidson (to Continental Can Co.). U. S. 2,091,966, Sept. 7. A quick-drying ink for use on nonabsorbent surfaces is made of a blend of solutions, namely, nitrocellulose in amyl acetate and diacetonealcohol, copal in methanol and ester gum in butanol and butyl propionate. A plasticizer, soft soap, a pigment and magnesium carbonate are also added.

ADHESIVE. Percy M. Clark and Thos. T. Taylor (to E. I. du Pont de Nemours and Co.); E. C. Pitman (to E. I. du Pont de Nemours and Co.). U. S. 2,092,050 and 2,092,084, Sept. 7. Surfaces to be joined are coated with a cellulose derivative, the hardened film is activated with propylene oxide containing about 10% of a volatile solvent (acetone, ethyl acetate or the like) or about 1% of dibutyl phthalate, and adhesion is effected with the aid of heat and pressure.

VINYL RESINS. G. J. Esselen (to Fiberloid Corp.). U. S. 2,092,056, Sept. 7. Condensing polyvinyl acetate, after partial hydrolysis, with formaldehyde and blending the product with dimethyl phthalate and another phthalate ester.

LACQUER. Kurt Thinius (to Deutsche Celluloid-Fabrik). U. S. 2,092,229, Sept. 7. A lacquer contains nitrocellulose with 11.5–11.9% nitrogen content, moistened with a very dilute alcoholic solution of a plasticizer, the only low-boiling solvent being a mixture of at least 50% absolute alcohol and 4% of a true solvent for nitrocellulose with benzene hydrocarbons.

HYDROCARBON RESIN. A. J. van Peski and J. F. M. Caudri (to Shell Development Co.). U. S. 2,092,295, Sept. 7. Making a resin by reaction of a diolefin with an olefin and an aromatic hydrocarbon in presence of an acidic metal halide catalyst.

CAN COATING. Vanderveer Voorhees (to Standard Oil Co.). U. S. 2,092,296, Sept. 7. A can coating resin with good adhesion to metal, for coating the inside of food or beverage tins, is made by catalytic polymerization of a liquid olefin such as isobutylene, isoamylene, isohexene, cyclohexene or trimethylethylene.

NONLIVERING COATING. Chas. Bogin (to Commercial Solvents Co.). U. S. 2,092,300, Sept. 7. Use of malic acid as an added ingredient to prevent livering in alkyd resin varnishes.

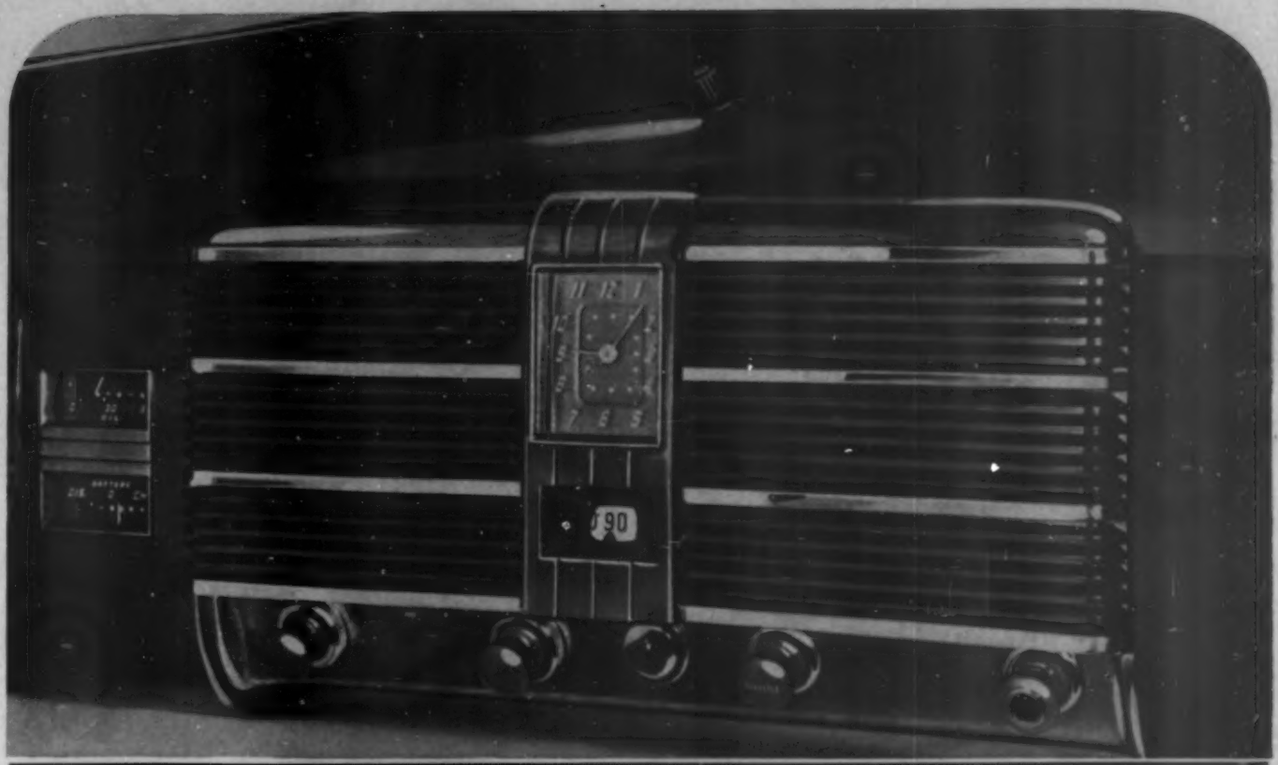
INSULATION. Thos. C. Scott and M. C. Field (to Western Electric Co., Inc.). U. S. 2,092,477, Sept. 7. Cellulose ether films for insulation windings on electrical conductors are made by partially etherifying a paper web without altering its mechanical structure.

VENEER. Carleton Ellis (to Ellis-Foster Co.). U. S. 2,092,502, Sept. 7. Making veneers with a coating of urea-thiourea-formaldehyde resin containing alpha-cellulose and a curing catalyst which liberates an acid during hot pressing to accelerate the hardening of the resin.

SURGICAL SUTURES. Willy O. Herrmann, Fritz Hammer and Wolfram Haehnel (to Chemische Forschungsges. m. b. H.). U. S. 2,092,512, Sept. 7. Threads, bands or tubes for surgical sutures or other materials requiring to be resorbed by the body are made of cellulose, polyvinyl alcohol and an agent which promotes resorption.

WRAPPING FOILS. Louis E. Lovett (to Industrial Rayon Corp.). U. S. 2,092,677, Sept. 7. Transparent wrapping foils are made of cellulose acetate and sucrose octaacetate in intimate solid admixture with each other.

SYNTHETIC RESIN. Carleton Ellis (to Ellis-Foster Co.). U. S. 2,092,713, Sept. 7. Making a toluene-soluble resin or balsam of the alkyd type, modified with a fatty oil. (*Please turn to page 74*)



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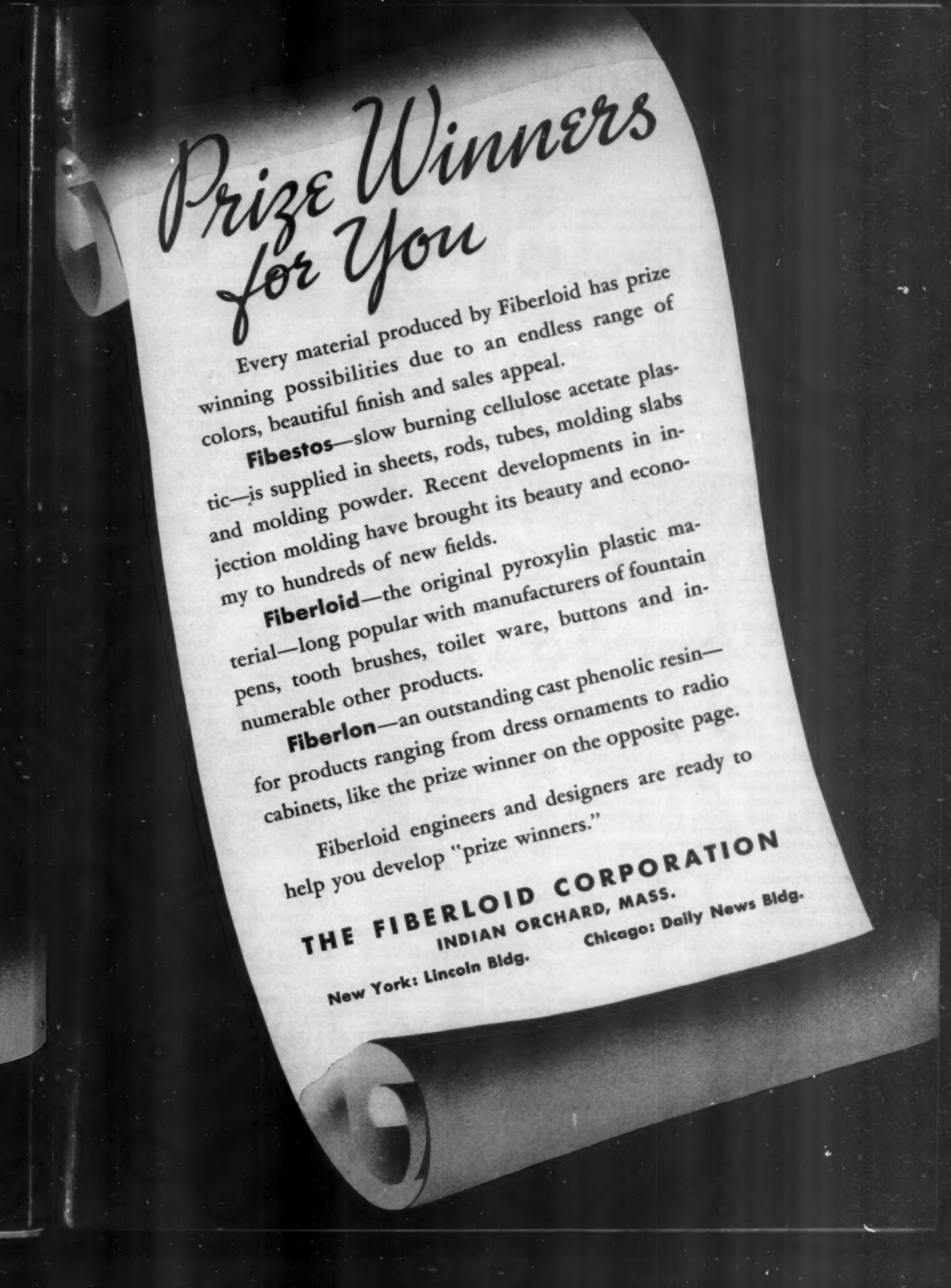
Prize Winner for 1937

The beautiful Kadette Radio Cabinet, cast to shape—in a variety of colors—from Fiberlon.


Prize Winners for You
Every material produced by Fiberloid has prize winning possibilities due to an endless range of colors, beautiful finish and sales appeal.
Fibestos—slow burning cellulose acetate plastic—is supplied in sheets, rods, tubes, molding slabs and molding powder. Recent developments in injection molding have brought its beauty and economy to hundreds of new fields.
Fiberloid—the original pyroxylin plastic material—long popular with manufacturers of fountain pens, tooth brushes, toilet ware, buttons and innumerable other products.
Fiberlon—an outstanding cast phenolic resin—for products ranging from dress ornaments to radio cabinets, like the prize winner on the opposite page.
Fiberloid engineers and designers are ready to help you develop "prize winners."
THE FIBERLOID CORPORATION
INDIAN ORCHARD, MASS.
New York: Lincoln Bldg.
Chicago: Daily News Bldg.

U. S. PLASTICS PATENTS

(*Continued from page 70*)

NITROCELLULOSE. Geo. B. Bradshaw (to E. I. du Pont de Nemours and Co.). U. S. 2,092,749, Sept. 14. Making a highly acid-resistant nitrocellulose by nitrating cellulosic material in two stages, first with a strong nitric acid with low water content and deficient in penetrating power, to effect a superficial partial nitration, and then with acid containing up to 4% water and a higher content of auxiliary penetrating acid, to a final nitrogen content above 13%.

SELF-HARDENING RESINS. C. Ellis (to Ellis-Foster Co.). U. S. 2,092,754, Sept. 14. Use of salicylic, acetylsalicylic or gallic acid as catalyst of thermal hardening in self-hardening urea-aldehyde resins.

LAMINATED LENSES. E. D. Tillyer (to American Optical Co.). U. S. 2,092,789, Sept. 14. Making nonshattering spectacle lenses or like optical glass products by cementing a plane glass support and a suitably ground lens together with a transparent cement formed by melting the crystalline alkaloid from pepper.

CIGARET PAPER. D. E. Strain (to E. I. du Pont de Nemours and Co.). U. S. 2,092,817, Sept. 14. Impregnating cigaret paper with a polymethacrylate resin or a homolog thereof.

ABRASIVES. R. C. Benner and R. L. Melton (to Carborundum Co.). U. S. 2,092,903, Sept. 14. Coating abrasive particles with a synthetic resin solution and dispersing in a gaseous medium while the solvent evaporates, leaving each particle coated with bonding material.

POLYMERIZING RESINS. G. K. Anderson and Wm. D. Johnston, Jr. (to Neville Co.). U. S. 2,092,998 and 2,092,999, Sept. 14. Use of an activated clay, or of an alkylsulfuric acid, as catalyst of polymerization in making coumarone resins from solutions containing coumarone and indene.

INSULATED CONDUCTOR. A. M. Lynn (to Western Electric Co.) U. S. 2,093,087, Sept. 14. Insulating wire by wrapping with a helical band of untwisted cellulose acetate filaments, heat treated to remove internal strains.

HARDENABLE RESIN. Elly Pollak. U. S. 2,093,364, Sept. 14. A water-soluble hard resin which can be further hardened with formaldehyde is made by condensing urea with hexamethylenetetramine and forming the initial hard resin by dehydration.

CELLULOSE DICARBOXYLATES. C. J. Malm and Chas. E. Waring (to Eastman Kodak Co.). U. S. 2,093,462, 2,093,463, and 2,093,464, Sept. 21. Making cellulose esters of dicarboxylic acids, with or without adding a monocarboxylic acid such as acetic acid; for example, making cellulose acetate phthalate, or making an ammonium, sodium, potassium, lithium, rubidium or caesium salt of a cellulose dicarboxylate, or making cellulose succinate by treating cellulose with succinic anhydride in pyridine.

HYDROXYDIPHENYL RESIN. Israel Rosenblum. U. S. 2,093,481, Sept. 21. Making a fusible, soluble resin by treating a condensation product of a mononuclear phenol, an aldehyde, a natural resin and a metal salt with hydroxydiphenyl (phenylphenol) and formaldehyde.

INSULATED CONDUCTOR. Ira Williams (to E. I. du Pont de Nemours and Co.). U. S. 2,093,501, Sept. 21. Insulating wire with a polymer of 2-chloro-1,3-butadiene.

MARKING GLASS. T. B. Drescher (to Bausch and Lomb Optical Co.). U. S. 2,093,601, Sept. 21. Identifying smooth, polished glass articles such as optical glass by marking them with a soluble alkyd resin paint and heating till the paint is polymerized to the desired extent.

UNDERCOATER. C. Ellis (to Ellis-Foster Co.). U. S. 2,093,715, Sept. 21. Making a priming paint with an alkyd resin modified with a natural resin.

HYDROCARBON RESINS. W. R. Derby (to Monsanto Chemical Co.). U. S. 2,093,749, Sept. 21. Making a hydrocarbon resin by polymerizing a mixture of olefins, diolefins and aromatic hydrocarbons in presence of aluminum chloride, and raising the melting point of the resinous product by condensing it with acetylene, still in presence of aluminum chloride.

PHONOGRAPH RECORD. Camille Dreyfus. U. S. 2,094,098, Sept. 28. A sound record is made with a playing face of a thermoplastic cellulose derivative plasticized with 35-60% of a suitable plasticizer.

CARBOHYDRATE DERIVATIVES. Henry Dreyfus. U. S. 2,094,100, Sept. 28. Condensing cellulose or other carbohydrate with an olefin under a pressure of at least 10 atm.

SAFETY GLASS. Wm. E. Nobbe (to Libby-Owens-Ford Glass Co.). U. S. 2,094,183, Sept. 28. Safety glass is made with a plastic interlayer and ordinary plate glass on one side, but with case hardened glass on the other side to modify the breaking behavior.

PHONOGRAPH RECORD. Barton A. Proctor (to B. A. Proctor Co.). U. S. 2,094,280, Sept. 28. A sound record blank is made with a tough, smooth impression-retaining surface backed by a deformable plastic layer slightly thicker than the depth of the sound track, and by a supporting base layer.

RESIN VARNISH. Jos. Rivkin (to Neville Co.). U. S. 2,094,331, Sept. 28. A resin which inhibits gas-checking during the drying of a tung oil varnish film is made by reaction of a coumarone resin with a phenol to give an alcohol-soluble product with low acid number.

BASE EXCHANGE RESIN. W. H. Kirkpatrick (to National Aluminate Corp.). U. S. 2,094,359, Sept. 28. A synthetic resin which can be utilized in base exchange reactions is made by condensing tannin with formaldehyde and mixing the product quickly with concentrated hydrochloric acid to form a stiff gel which is then cooled, comminuted, washed and dried.

SYNTHETIC BALSAM. L. C. F. Pechin (to Brick Trust, Ltd.). U. S. 2,094,373, Sept. 28. Making a potentially reactive balsam-like liquid resin by condensing phenol with formaldehyde in presence of benzoic and cinnamic acids and insufficient ammonia for neutralization, and adding glycerol, cyclohexanol and glycerides of acetic and camphoric acids in the early stages of the condensation.

CHLORINATED RUBBER. L. Orthner, O. Böhme, G. Meyer and W. Becker (to I. G. Farbenindustrie Aktiengesellschaft). U. S. 2,094,408, Sept. 28. Forming a disintegrated chlorinated rubber product by pouring a dilute solution of chlorinated rubber into water hot enough to evaporate the solvent, and withdrawing the precipitate quickly.

TRANSFER. Maurice G. Horne and Mario Barone. U. S. 2,094,430, Sept. 28. A transfer bearing, on a glue-covered impervious backing sheet, a layer of cellulose derivative, a film of transfer matter, a layer of substance impervious to cellulose derivative solvents and a final protective layer of cellulose derivative.

RESIN ALCOHOL ETHER. E. R. Littmann (to Hercules Powder Co.). U. S. 2,094,545, Sept. 28. Etherifying a resin alcohol such as abietyl alcohol with an alkylating agent, e. g., with diethyl sulfate to form ethyl abietyl ether.

GRINDING WHEEL. H. O. Anderson (to Norton Co.). U. S. 2,094,556, Sept. 28. Abrasive shapes are made by treating an open mesh cloth with an adhesive and then with abrasive grains, matching sections of the cloth to form continuous cells, and molding to shape.

COATED FABRIC. D. McBurney and R. E. Thomas (to E. I. du Pont de Nemours and Co.). U. S. 2,094,613, Oct. 5. Coating a fibrous base with a cellulose derivative, drying, wetting with a solvent, pressing onto the cellulose derivative surface a soft tissue sheet of cellulosic fiber, and drying the product.

SEALING COMPOSITION. A. Weisenburg (to Crown Cork and Seal Co.). U. S. 2,094,627, Oct. 5. A strong, resilient cork composition which will not crack nor disintegrate under sealing pressure is made with a binder comprising a mixture of synthetic resins dissolved in a plasticizer.

(*Please turn to page 94*)

ABC

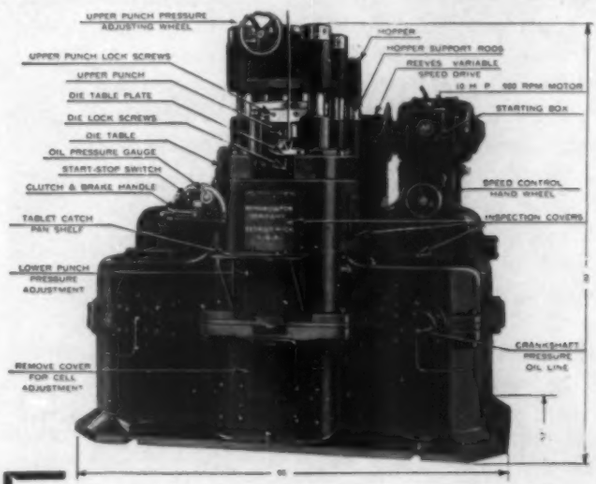
CRESYLIC ACID

CASEIN

Dibutyl Phthalate
Diethyl Phthalate
Dimethyl Phthalate
Triacetin

AMERICAN-BRITISH CHEMICAL SUPPLIES, Inc.
180 MADISON AVE., NEW YORK, N.Y.

Associated Company
CHAS. TENNANT & CO. (CANADA) LTD.
372 Bay Street, Toronto 2, Canada



COLTON

Proudly Presents

The No. 14

... 150 ton, Dual Compression Preforming Press

The finest machine of its kind ... specially designed to meet the new standards of large unit molding. All working parts sealed against dust. Pressure feed oiling to all bearings. Maximum cell depth ... $3^{3}/_{4}$", maximum dia. round tablet ... $4^{1}/_{2}$". Speed 25 to 30 tablets per minute. Double toggle, twin crankshafts ... hence compression from *both* sides of tablet insuring uniform density throughout.

Send for full details about this and other Colton preformers for every molding purpose.

ARTHUR COLTON CO.

2604 E. Jefferson Avenue DETROIT, MICHIGAN

COLTON DETROIT

NEWS

MONSANTO CHEMICAL COMPANY ANNOUNCES that Thornton Jesdale has been made assistant manager of its Chicago District Sales Office to succeed M. V. Pennal who has resigned. Mr. Jesdale has been associated with Monsanto's Chicago Office for several years.

BRUCE PUFFER, FORMERLY SALES MANAGER of the Industrial Alcohol Division of the American Distilling Company, has joined the sales department of Commercial Solvents Corporation, as a result of the recent transfer of the American Distilling Company's industrial alcohol business to Commercial Solvents.

THE REED - PRENTICE CORPORATION HAS opened a New York office at 75 West Street, Room 1101, to handle the sales of plastic injection molding machines in this territory. George W. McIntyre will manage the office.

H. V. WALKER CO., AFTER LONG EXPERIMENtation, has developed a marking lacquer which is said to have strong adhesive qualities. When it is used it will stick instantly to cellulose acetate and permanently retain this adhesion. The marking lacquer is available in black, white and several colors.

IN THE CONSTANT STRUGGLE OF MANKIND to free itself from the bondage of social and economic limitations, many formulas have been tried. None have approached the simple remedy of uniting Agriculture, Industry and Science in combined attack on the problems of the day, particularly that of enforced idleness of men and acres. This new alliance, called Farm Chemurgy, is sponsored by the National Farm Chemurgic Council, Inc., and affiliated organizations. A folder recently issued provides a brief summary of the present work of the Council and its aims and purposes and a large chart on page 4, shows the inter-dependence of farm income and factory payrolls.

THE SYNTHETIC RESIN MANUFACTURERS ASSOciation has appointed Foster D. Snell, Inc., consulting chemists and chemical engineers, to act as the official laboratory of that association. At the annual general meeting of the Society of Chemical Industry held in July, 1937, at Harrogate, England, Foster Dee Snell was elected a vice president of the society. This is the first time since 1928 that an American has been elected as an officer of the Society of Chemical Industry.

SYNTHETIC YARN EQUIPMENT THAT MUST function in corrosive chemicals, and car water-pump impellers that resist anti-freeze and cleaning compounds, are a few of the many new uses for General Plastics' molding material known as Durez 77 SB. Unique among plastics for its inertness, 77 SB also resists frictional wear and permits machining operations without impairment of its water- and chemical-resistance. Its use on pump impellers proved that it wears better than metal, and its lighter weight and non-resonance reduce noise.

HOWARD G. FAIRFAX, FOR MANY YEARS CONnected with The Hoover Company, has recently been appointed plastic engineer by The Firestone Tire and Rubber Company.

A NEW BAUHAUS UNDER THE SPONSORSHIP of the Association of Arts and Industries, Illinois, has been established in Chicago. Dr. Walter Gropius, professor of Architecture at Harvard University will act as advisor in all school matters. Professor Gropius was the founder of the world famous art university, the Bauhaus, in Dessau and Professor L. Maholy-Nagy, formerly Professor of the Bauhaus and a painter and designer of international reputation will direct this new School of Design.

USERS OF ALL FORMS OF INDUSTRIAL ALCOHOL in the packaging industry, who have heretofore been supplied by The American Distilling Co., or its affiliate, American Commercial Alcohol Corp., will be served from now on by Commercial Solvents Corporation.

WALTER BAERMANN, INDUSTRIAL DESIGNER, whose work is familiar in many fields, heads the faculty of a graduate school of industrial design and design planning located in Carmelita Gardens, Pasadena, California. Mr. Baermann will be professor of Design, while Dr. Donald S. Clark of the California Institute of Technology, will guide the course in Materials and Manufacturing Processes. Philip S. Fogg, assistant professor of Economics at the California Institute of Technology and formerly of the Harvard Graduate School of Business Administration will direct the course in Economic Background.

THE NINTH ANNUAL PRODUCTS EXPOSITION of the Purchasing Agents Association of Chicago will be held at the Hotel Sherman, Chicago, on Wednesday and Thursday, November 17 and 18.

DR. LEO HENDRIK BAEKELAND, INTERNATIONally known inventor of Bakelite resinoid and Velox photographic paper, was recently named an Honorary Member of the Societe De Chimie Industrielle, France. This honor was conferred upon him for the eminent services he has rendered to science and industry. Certificates to Honorary Members were presented on September 30th, in the presence of the President of France.

THE BAKELITE CORPORATION PLAYED HOST TO a group of plastic molders from Chicago and vicinity on Tuesday, September 26, at the Palmer House, Chicago. After cocktails and a delicious dinner, Allan Brown,

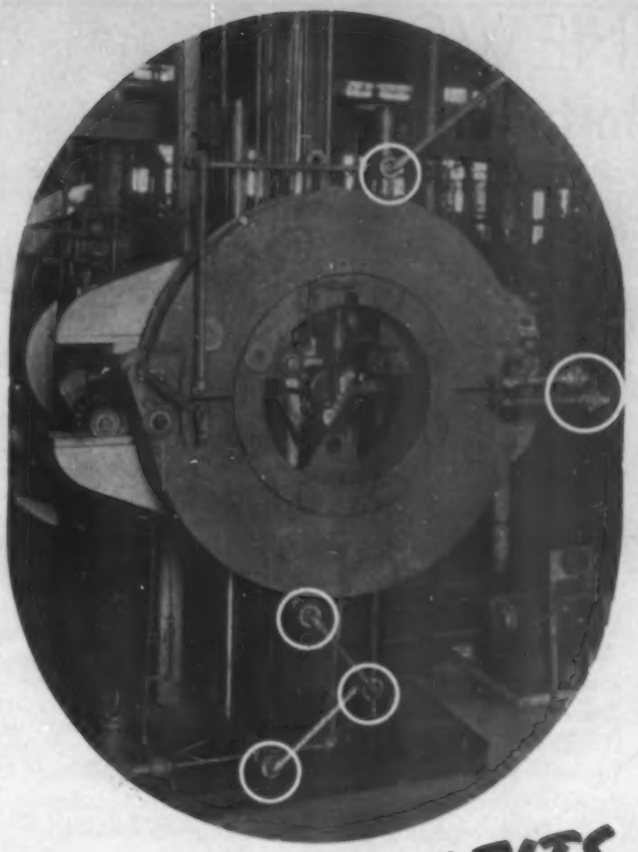
Consolidated
MOLDED PLASTICS
Beautify AUTOMOBILES *and*
AUTO ACCESSORIES

● Plastic control knobs and handles, horn buttons and gear shift knobs, molded by Consolidated, are used extensively for automotive applications. Products for every purpose can be given the same "beauty treatment" with plastic parts of modern design, in any desired color, with any required property molded into the plastic material.

CONSOLIDATED
Molded Products CORP.
SCRANTON BUTTON — FOR 50 YEARS — BRAND

Genl. Offices and Factory
SCRANTON, PA.

New York :: Rochester
Chicago :: Detroit :: Cleveland
Philadelphia :: Bridgeport



PROTECT PROFITS
WITH BARCO JOINTS

Swivel 7AS-8BS

Swivel 7S-8DS

Swivel 7AS-8CS

● Operating at about 100 pounds steam pressure, and opening with a very wide spread, the tube mold illustrated above provides a severe test for all flexible connections. It is significant that BARCO joints are practically universal on this type of mold. They provide the flexibility which permits maximum production speed without danger of joint failures and costly shut-down . . . contributing definitely to steady output and manufacturing profits.

Catalog No. 256 gives full details.

BARCO
SWIVEL JOINTS
BARCO MANUFACTURING CO.
1813 W. Winnemac Ave., Chicago, Illinois

NEWS

advertising manager of the corporation, gave those assembled an illuminating talk on their advertising and merchandising policy. Gordon Brown, sales manager, also addressed the group.

POWER PIPING CORPORATION, SUBSIDIARY OF Blaw-Knox Company has been awarded a contract to design, engineer, and construct all the steam and high pressure hydraulic piping, including a boiler plant and a heating system, for the new molded plastics plant being erected in Cambridge, Ohio, by the Reynolds Spring Company.

SURVIVAL OR ADVANCE IN SO MANY INDUSTries is dependent upon the technical advances of chemistry and chemical engineering that the present united American chemical industry represents a key factor in our national life. The Sixteenth Exposition of Chemical Industries will be held at Grand Central Palace, New York, during the week of December 6th to 11th, 1937, and will provide a preview of plant process machinery, laboratory apparatus, instruments, chemicals and chemical products reflecting the current acceleration along the entire industrial front of American enterprise.

ACCORDING TO C. C. CONCANNON, CHIEF OF the Commerce Department's Chemical Division, United States exports of plastic materials, for use abroad mainly in the manufacture or fabrication of a thousand and one products, aggregated 9,500,000 pounds valued at $3,413,000 in the first half of the current year against 6,245,000 pounds valued at $2,248,000 in the corresponding months of 1936, a gain of more than 50 percent both in quantity and in value, on the basis of preliminary statistics. Export trade in a number of the items included in this group was developed in more recent years.

E. I. DU PONT DE NEMOURS & COMPANY, INC. has accepted an invitation from The Franklin Institute of Philadelphia to present an exhibit of certain of its diversified chemical products at the Institute on Benjamin Franklin Parkway, Philadelphia. It opened Wednesday, October 13.

L. A. HEYMANN HAS BEEN NAMED SALES MANAger of Universal Plastics Corporation and N. Hyman has been appointed representative for the company in the metropolitan area.

A CREW OF FORTY-TWO WARNER BROTHERS light men, cameramen and directors recently completed a full color motion picture in the Fords, N. J., plant of the Catalin Corporation which will be shown under the title "The Plastic Age" in more than 8000 theatres in the United States and Canada and 5000 abroad starting this

(Photo by Warner Bros.)

month. Directed by Ira Genet, this picture will be released as a Vitaphone Pictorial Review feature and describe in a whole aurora of color how this phenolic resin is made from phenol and formaldehyde. The picture follows the course of processing Catalin from the laboratory to a series of close-ups of finished consumer items ranging from jewelry and electric switch plates to bowling balls and buttons. Close-ups of all phases of production, including an interesting view of laboratory technicians testing color fastness and durability of buttons, makes this an informative subject imparting much data that is not generally known. Photo shows three of the thirty lights set up on a "take" of the department in which the finished material is driven from its lead molds with pneumatic hammers. The process is described in sound by a well-known commentator and includes a musical accompaniment.

ARCHITECTS, ENGINEERS AND BUILDERS, BOTH here and abroad are showing keen interest in the construction of the Perisphere and Trylon, the two unique structures which will dominate the $125,000,000 International Exposition now rapidly being constructed near the center of New York City. The Perisphere, which will house the Exposition's Theme Exhibit, will rise 18 stories above the New York World's Fair grounds. The Trylon will be equal to 50 stories and will be the point of orientation for the entire Fair.

J. A. SCHALLENBERG WAS RECENTLY APpointed assistant comptroller of Worthington Pump and Machinery Corp. Mr. Schallenberg has served the corporation in various capacities in the treasury and accounting departments during the past twenty years.

THE ANNUAL FALL OUTING OF THE SOCIETY OF the Plastics Industry (Eastern Division) was held at the Berkshires Hunt and Country Club, Lenox, Massachusetts on September 28th and 29th with the largest attendance this Division has yet enjoyed.

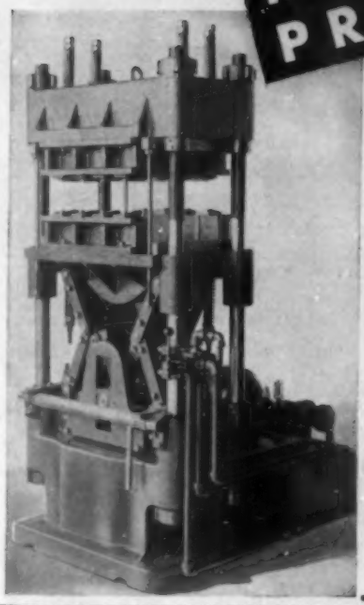
President Huidekoper presided at the banquet Tuesday evening and Secretary-Treasurer Bill Kelly reported on finances and the preceding meeting at Wawassee.

After the dinner it was proposed and discussed that all molders and materials suppliers report the gross volume

New Economies for Plastic Molders

No. 2 Increase Production

STANDARD Self-Contained MOLDING PRESSES

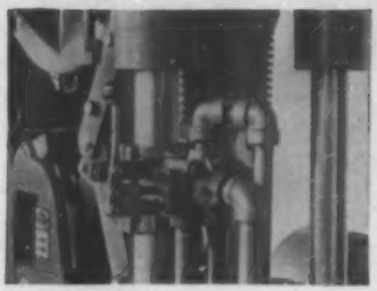


Operators spend less time tending the press . . . are free to do other work when Standard Self-Contained Molding Presses are on the job.

Because the Standard Self-Contained Molding Press automatically changes from low to high pressure at the proper time without any attention from the operator and because they close and open faster, production has been increased 30% to 50% over what had been obtained on other presses in many plants.

Increased production is but one reason why many plants have re-ordered Standard Self-Contained Molding Presses, some for the sixth time. Let us tell you the other operating advantages to be found in a Standard Press.

50 - 100 - 150 - 300 tons



Complete control of the press is centered in the four-way valve. By moving the lever shown above forward or backward, the operator opens and closes the press; if he desires to gas the mold during operation, it can be easily done.

This is one of a series of advertisements explaining why Standard Self-Contained Molding Presses are specified by many plastic molders. Let us tell you how these presses can show you new ways to efficient and economical molding. Send for new folder.

STANDARD MACHINERY COMPANY

"Standard Since 1875"

116 WATER STREET MYSTIC, CONN.

DU PONT

P.A.C. FORMALDEHYDE
REG. U. S. PAT. OFF.

U. S. P. Solution; Water White; Low in Acid; Low Metal Content

PARAFORMALDEHYDE

95% Minimum Strength

HEXAMETHYLENETETRAMINE

Products of Dependable Uniformity . . . Prompt Shipments in Modern Containers

DU PONT
REG. U. S. PAT. OFF.

The R. & H. Chemicals Department
E. I. DU PONT DE NEMOURS & COMPANY, INC.
Wilmington, Delaware

District Sales Offices: Baltimore, Boston, Charlotte, Chicago, Cleveland, Kansas City, Newark, New York, Philadelphia, Pittsburgh, San Francisco

NEWS

of their sales month by month to a neutral agency who would compile these figures and report the totals to subscribing members to indicate to the individual companies the trends of the industry and would permit them to know whether or not their own sales were in line with this trend.

It was felt by many of those present that such cooperation and distribution of information would be exceedingly valuable to members and it was left with the officers to invite all the members of the S.P.I. to act upon this suggestion and take advantage of it.

There were many foursomes of golf despite the rain on Tuesday and since Wednesday turned out to be a pretty good day, most of those attending remained until after luncheon to take advantage of it.

THE BRITISH INDUSTRIES FAIR WILL BE HELD again in London and Birmingham from February 21st to March 4th next. It is expected that the total area occupied by exhibits will exceed 900,000 square feet and that 3000 exhibitors, representing some seventy-five United Kingdom trades, will participate.

The British Industries Fair is strictly a trade fair and therefore affords an excellent opportunity for buyers from all parts of the world to make personal contacts with United Kingdom manufacturers. Further information and particulars of facilities offered to visitors can be obtained from the Commercial Department of the British Consulate General, 25 Broadway, New York.

TEN YEARS AGO THE SOY BEAN WAS AN INSIGnificant crop in this country, but today it looms large on the horizon as a potential savior of the corn-hog states. The demand last year for soy bean oil in paint, varnish, linoleum, etc., exceeded 15,000,000 pounds, and for meal used in plastics was over 1,000,000 pounds.

Last year soy bean processors installed fifty-two new expeller units for separating the oil from the meal, thus bringing the total available plant capacity to 55,000,000 bushels annually. The 1937 crop is estimated at over 50,000,000 bushels. Over 300 food and industrial products are now made from the soy bean.

NEW MULTI-POINTER GAGES AND BOILER METers put out by the Bailey Meter Company are equipped with indicating scales of ivory Plaskon. The use of this plastic has, besides enhancing the appearance of the instrument, effected a decrease in production costs.

THE IMPORTANCE OF BUILDING AS A FACTOR IN the advancement of living standards, and in maintaining the national economic balance, is reflected in a compendium of "Facts—about Construction and Housing" issued recently by the Chamber of Commerce of the United States.

Editor, MODERN PLASTICS:

It's a date! Take page 27 of September MODERN PLASTICS and crease in the center to the left. If all has gone well up to now, you should see Old Dobbin headed straight for your John Henry. (I'll take the nag above.)

We agree with you 100 percent in everything you say in your editorial "What Is Industrial Design?" The only fault we have to find is the example you chose, for here, Mr. Lougee, believe it or not, is an outstanding example of Industrial Design. In the Bell and Howell Camera job a great change for the better was effected, with only a slight change in tools and at practically no cost to the manufacturer, when the volume of the item is taken into consideration.

Granted that lines—parallel, perpendicular or otherwise—do not make Industrial Design any more than a cellulose acetate charger makes you Lady Godiva. Our treatment was not concerned with those lines, although, unfortunately, the article you read gave the impression that it was.

Please bear in mind that the Camera we were restyling was a brand new product which meant that thousands of dollars had been invested in tools and equipment for its production. It was our job to improve the appearance using the same tools. The only mechanical change necessary was the relocating of a screw or two to take care of fastening the new, more legible calculator.

We know that a greater contrast could have been accomplished between the two cameras if we were given a free hand, as we were with the Burton Light on page 21 of the September issue.

If you don't think *that* job is also an outstanding achievement, both Reinecke and I will join you in the Park Sunday to let down our hair.

Very truly yours,

BARNES & REINECKE
(signed) J. F. BARNES

664 North Michigan Avenue
Chicago, Illinois

That's a snappy reply but is it an answer to my comment on "What is Industrial Design?" If a "brand new product" has to be redesigned as soon as it reaches the market then something must have been wrong with the original design. Simply adding a line down the side may have saved the production tools and it is barely possible this made the camera look larger, but IS it possible to simply add "lines—parallel, perpendicular of otherwise" to a wrong design and make it right? *Editor*

E. NORRIS BROWN WRITES TO SAY THAT ITEM 3 on page 32 of the September issue which pictured tiny black cats of Tenite which are molded by Northern Industrial Chemical Co. and used by Distillers Co. Ltd. to tie around the necks of Boord's gin bottles were designed by him. He further states that Northern Industrial Chemical Co. mold these exclusively for him. This we did not know at the time of publication.

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EVERY DAY this Toulmin book can help you. Don't just THINK you have a patentable invention . . . KNOW! Learn when Design is NOT Invention.

An opportunity is lost—because somebody lacked clear understanding of the true characteristics of Invention. Time and money are wasted—on an "invention" which could never satisfy the legal definition of the term. EVERY manufacturer might profitably know MORE about the essential principles of Patentable Invention. INVENTION AND THE LAW is unique—a convenient manual answering the various perplexing questions as to what is, and what is not, patentable invention.

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Here is a book that gives you a clear and understandable statement of the RULES on each invention question. It summarizes, in a single volume, the findings of the Federal courts—classified for ready reference. Two outstanding sections in particular: What Is Invention and What is Not Invention make the work invaluable.

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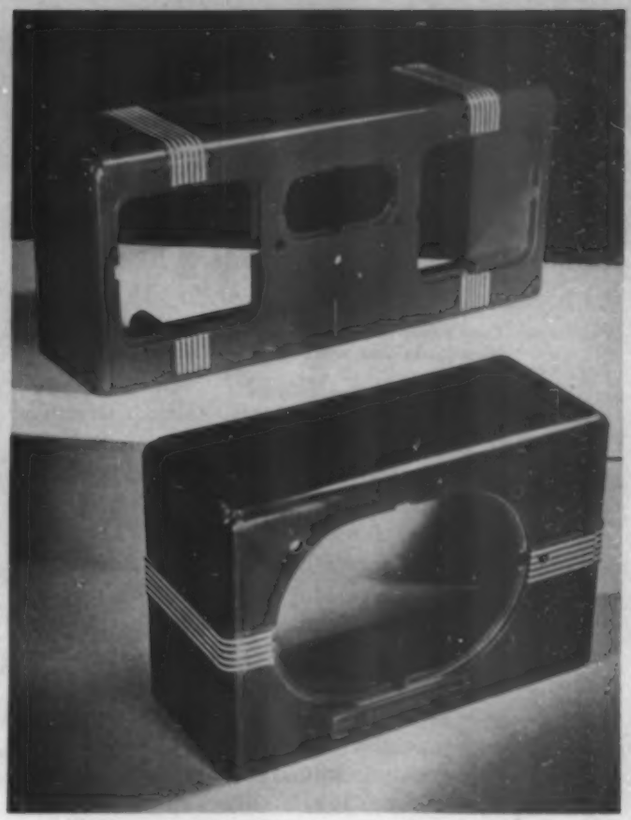

Economy . . . dependable quality . . . scheduled deliveries . . . and an extra measure of service are "in the bag" when it's an order for molded plastics from Auburn Button Works.

More than sixty years' experience conquering tough molding problems has given Auburn an "edge" when it comes to jobs that are so different they call for the exercise of all of Auburn's pioneering experience . . . and a definite extra something when it is a job of the ordinary every day variety. There's experience you can profit by in Auburn's record . . . experience that puts the solution of your problems "in the bag."

Established 1876

MOLDED PLASTICS DIVISION OF
AUBURN BUTTON WORKS, Inc.
AUBURN, N. Y.

PUBLICATIONS

Booklets reviewed in these columns will be sent without charge to executives who write for them on their company letterheads. Other books will be sent postpaid at the publishers' advertised prices

Elasticity, Plasticity, and Structure of Matter

by R. Houwink

Publishers—Cambridge: At the University Press
New York: The Macmillan Company, 1937
Price $6.00 376 pages

The author has assembled in this volume a wealth of material on the physical-organic chemistry relating to the flow properties of synthetic and natural industrial products. In the first four chapters the physical phenomena observed in elastic and plastic deformations and the effect of various internal and external conditions on this behavior are described. Subsequent chapters deal with the elastic and plastic characteristics of glass, resins, asphalts, rubber, cellulose and its derivatives, proteins, paints and lacquers, clay, and sulphur. For many of these materials a correlation between physical behavior and molecular structure is possible. The deformation of crystalline substances and current conceptions of the mechanism of crystalline slip are considered in a special chapter prepared by W. G. Burgers. This book should be of particular interest and aid to investigators working with the synthetic plastics, a class of materials which are inherently amenable to improvement of properties by modification of their internal structure. G. M. K.

Chemical Engineering Catalog

Reinhold Publishing Corp.
$3.00 1034 pages

The twenty-second annual edition of Chemical Engineering Catalog of 1034 pages is invaluable as a reference work. It contains an alphabetical list of firms represented; a trade name index which is limited to products of advertisers in the book; a section of equipment and supplies which comprises an index, then catalog data; chemicals and raw materials, also arranged with an index, then catalog data; and a technical book index and catalog. Copies may be obtained without cost by those engaged in the chemical and allied industries upon assurance that the book will be returned upon publication of the 1938 edition. To others the price is $3.00.

Industrial Art in England

by Nikolaus Pevsner

Published by Macmillan Company
Printed in Great Britain at Cambridge University Press
Price $5.00 234 pages

This book is a serious criticism of present industrial and commercial practice, and of methods of training and using designers. It is based upon a study by the author which took him to some 150 manufacturers where he inquired into the genesis of their designs. He obtained from directors, managers, craftsmen, foremen, designers, their reasons, their methods, their attitude toward design. Then he went to shops and stores to find out what effect they believed design to have on sales. And finally he found a way to test the reactions to design by potential buyers.

From pots and pans to motor cars he reveals the results of his study in a manner to be of definite service to all who create merchandise they hope to sell.

Elektrotechnische Isolierstoffe

Edited by R. Vieweg

Published by Verlag von Julius Springer, Berlin, 1937
Price (foreign) RM 19.80 295 pages

Both theoretical and applied aspects of electrical insulating materials are considered in this book which consists of eight lectures delivered in 1937 under the joint auspices of the Verbandes Deutscher Elektrotechniker and the Technischen Hochschule Berlin. The subjects of the various papers and their authors are as follows: "Physical fundamentals with special reference to inorganic insulators" by W. Eitel; "Organic insulators" by R. Vieweg; "Testing methods and results" by G. Pfestorf; "Ceramic insulators" by W. Weicker; "Organic insulators for high voltage" by W. Estorff; "Insulators for low voltage" by H. Burmeister; "Insulators in the communications industry" by K. Franz; "Insulators for electric heaters" by W. Fischer. Deserving of special mention are the scope and clarity of the 235 illustrations which appear in the book.

Kunststoff-Wegweiser

by G. Kranzlein and R. Lepsius

Published by Verlag Chemie, Berlin, 1937
Price (foreign) RM 1.15 140 pages

This booklet presents very briefly a survey of plastic materials manufactured in Germany, including the steps involved in their synthesis, their properties and methods of determining same, and their various applications. The list of trade names of German products with accompanying information on chemical type, use, and manufacturer, is apparently limited to currently marketed products and should be of interest in comparison with a similar list of U. S. products published in the October issue of MODERN PLASTICS. Prepared as a guide for visitors at the Exhibition of Plastic Materials of Achema VIII, the booklet gives a concise picture of the German plastics industry in 1937 and merits wider circulation than originally intended. G. M. K.

CONTINENTAL-DIAMOND FIBRE COMPANY HAS issued a new catalog on Micabond, a bonded mica insulating material. The catalog shows the various

We thank you

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You have brought honor to our companies by winning three awards in the two MODERN PLASTICS COMPETITIONS.

This is further evidence of your thorough knowledge of design and merchandising.

We recommend the services of your organization for practical industrial design intelligently applied.

M. C. Buchner President
CHICAGO MOLDED PRODUCTS CORP.

J. J. Forengald President
BURTON MANUFACTURING CO.

E. H. White General Manager
WHITE MANUFACTURING CO.

WE ARE PROUD INDEED
MODERN PLASTICS....
To have been chosen as molders by Chase Brass and Copper Company for the handles and bases of these exquisite Plastics Competition Prize Winners.....
And to have justified the verdict of your board of judges who felt, as we did, that these plastic parts marked a significant advance in both design and production.
PLASTIC MOLDING CORPORATION
SANDY HOOK CONNECTICUT

PUBLICATIONS

forms in which the material is available, explains its manufacturing process and tabulates dielectric properties, sizes, specifications, etc., of Micabond Plate, Paper, Cellophane, Fish Paper, Cloth, Press-Board, Tapes, Tubings, Segments and "V" Rings.

GEORGE GORTON MACHINE CO. HAS RECENTLY issued a 32-page booklet, 1319-B, describing their die and mold duplicators. Illustrations showing the comparative sizes and appearances of the machines are included.

TINIUS OLSEN TESTING MACHINE COMPANY HAS issued a new booklet illustrating and describing stiffness testers for plastic sheets and rods, sheet steel, tin plate, plywood, mica, etc. Methods of testing are also outlined and notching jigs described.

HAVEG CORPORATION RECENTLY ISSUED A bulletin on standard size Haveg pipes, fittings, valves and fume ducts. In addition to giving mechanical details it also includes a table of chemical resistance properties.

THE 136-PAGE SPIRAL WIRE BOUND CATALOG No. 4 listing and describing chemical, bacteriological, engineering, electrical and general scientific and other technical books of American and British publishers, offered to technical workers, by Chemical Publishing Co. Inc., met with such a great demand that it is now out of print. Catalog No. 5 is now ready and will be mailed to any technical worker sending 10¢ in stamps or coin.

THE DRAMATIC STORY OF MAN'S AGE OLD struggle to control nature's most powerful force—heat—is told in a publication recently issued by Johns-Manville. Conservation of heat through installation in almost every type of application is explained.

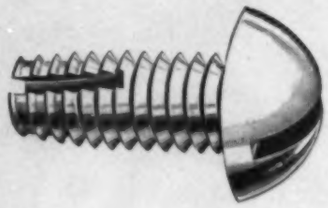
"CHEMICAL AND INDUSTRIAL EQUIPMENT," a new Read Machinery Co. Inc. catalog, describes that company's complete line of chemical mixers, acetylators, blenders, dry ingredient material handling equipment and others. The catalog is illustrated to show each type of machine and its particular adaptation.

THE CHARLES L. JARVIS COMPANY, MANUFACturers of power appliances, has issued a 28-page catalog describing their rotary files, polishing tools and grinding wheels which are used for finishing and polishing molds.

MINNEAPOLIS HONEYWELL REGULATOR COMpany has recently issued a condensed catalog and price list, illustrating and describing their automatic controls and control systems as well as the Brown instruments for indicating, recording and controlling.

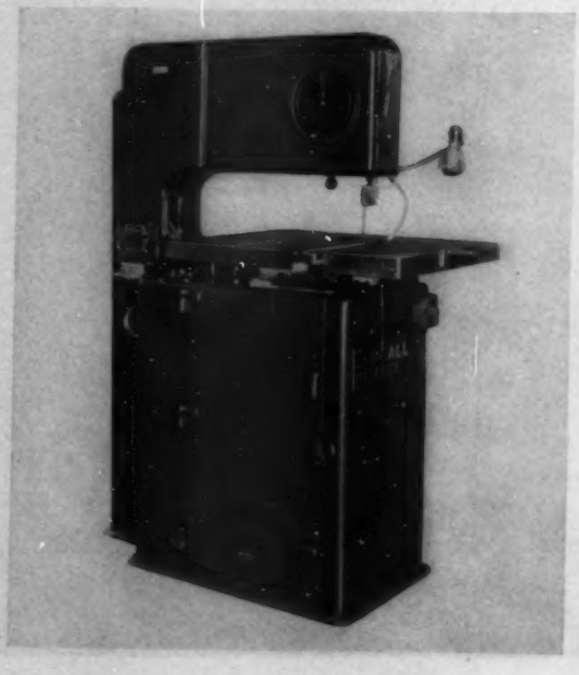
EQUIPMENT

THE SHAKEPROOF LOCK WASHER COMPANY recently announced the development of a screw that actually cuts its own thread in metals and plastics of practically any thickness. Its patented, thread-cutting slot, plus a special hardening process, eliminates the separate tapping operation normally required in the use



of standard machine screws. Important production savings in both labor costs and time are reported by the use of this new fastening method and, because, the screw remains in the threads it has cut, a better fastening is claimed. Another advantage is the fact that, should it ever be necessary to replace the screw, an ordinary machine screw of the same size will fit its threads.

A NEW DOALL THREE-IN-ONE CONTOUR MAchine with 30 in. throat capacity has been placed on the market by Continental Machine Specialties, Inc. A feature of this new machine is a built-in automatic instant butt-welder for the saws. The new welding unit is a compact device having features not found in single-purpose saw butt-welding machines. Narrow-blade saw welding requires a precision welding instrument in order to get the exact amount of current for each width of saw.



The Plastics Industry's

RECOGNIZED SINCE 1915 as one of the most important industrial exhibitions in the country, The Exposition of Chemical Industries will be the BIG EVENT of the year for the Plastics Industry.

Here you will have an opportunity to inspect the products of 300 manufacturers in one spot—see their operation, learn their new features, discuss your problems first-hand with the best informed technical men in the industry. Renew friendships, contact fellow-workers in kindred activities.

Keep up-to-date on the newest methods, materials and equipment; many may be helpful in developing new products, in speeding production, in cutting costs.

By all means, plan to visit this outstanding biennial exposition—and bring your associates.

The Exposition Announces as the Winner of its Contest for a Slogan for the Chemical Industries:
"CHEMICAL RESEARCH CREATES INDUSTRIES"
Submitted by: Norman E. Diehl, Asst. Div. Purch. Agent, E. I. Du Pont de Nemours & Co., Wilmington, Del.

16TH EXPOSITION CHEMICAL INDUSTRIES

GRAND CENTRAL PALACE **DECEMBER 6 TO 11** NEW YORK N. Y.

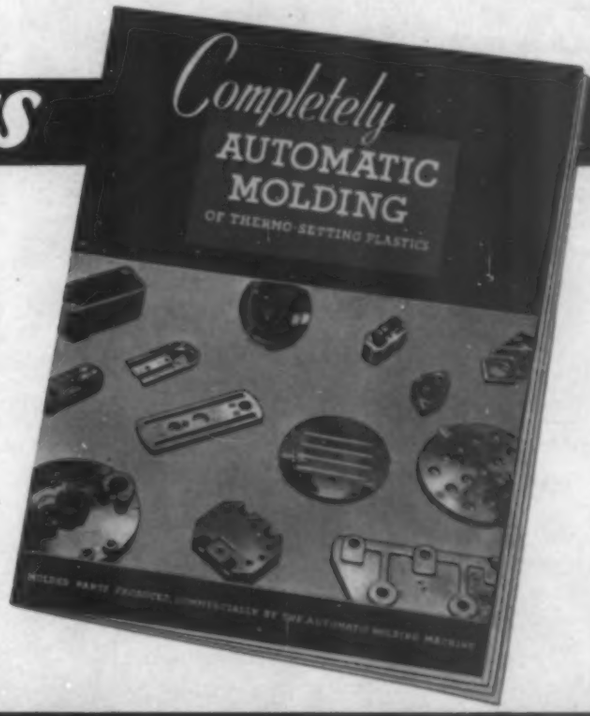
7881

It's NEW and it's News

You will want to know all about the machine that makes automatic molding commercially practicable and economically sound. We'll be glad to send you this new folder . . . or you may see this machine in operation at the Chemical Show, Grand Central Palace, N. Y., Dec. 6-11.

And when you visit the show, be sure to examine our new No. 280 Stokes Standard Preforming Press for pieces up to 4" dia.

F. J. STOKES MACHINE COMPANY
5934 Tabor Road Olney P. O. Philadelphia, Pa.



F.J.Stokes MOLDING EQUIPMENT

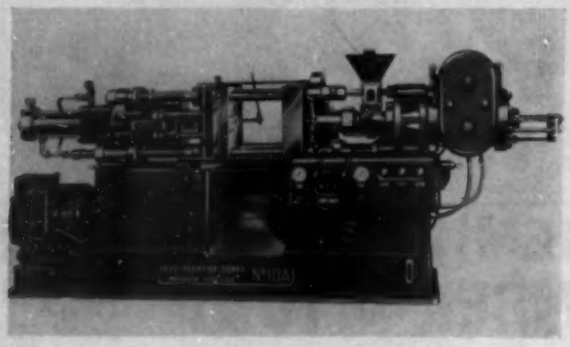
FJS Est. 1895

EQUIPMENT

REED-PRENTICE CORPORATION RECENTLY ANnounced its new model 10-A Plastic Injection Molding Machine on which the stationary die plate has been increased over previous models to $4^{7}/_{8}$ in. thickness and is cut from solid steel plate.

The steel movable die plate has been increased 1 in. in thickness, now measuring $4^{1}/_{2}$ in. Improved ribbing of die plate and longer bearing on the tie bars $10^{1}/_{4}$ in. are standard equipment and the die plate is equipped with bronze bushing with oil facilities.

A larger pump gives 120 in. per minute continuous material plunger speed with pressure on material from 2000



to 21,000 pounds per square inch. Regular equipment now includes automatic indicating control pyrometer and there are two rheostats, one for the rear of the heating unit for independent control of heat to front and rear heating bands.

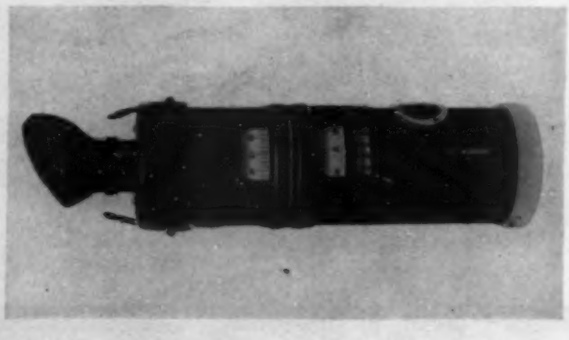
A number of other minor improvements include improved timing units and location of timers, push buttons and dials for easier operation and shut-off valve for oil gages is furnished. A table of specifications is available to those interested in this new and larger machine.

THE BALDWIN-SOUTHWARK CORPORATION RECently announced a tilting head press for molding plastic materials. The head is hydraulically actuated backward and forward in a horizontal plane by rams. It rotates through an arc of 90 degrees. These movements are under full simple control, readily adjustable from any desired position to the maximum. The head is designed to prevent deflection eliminating poorly pressed pieces with heavy flash fins made in the center cavities of molds. This permits the use of much larger molds (from front to back). The head is so balanced as to eliminate the moving of a heavy mass from a vertical to an angular position with its accompanying racking impact when stopped. This feature permits the construction of presses of the highest tonnage and very large platen areas. The head is fitted with a hydraulic push and pull ejector that works independently of any other part of the press, permitting the ejection of the pressed product at any point of platen

stroke or head position. The ejector ensures parallel movement of the ejector bars preventing the ejecting pins in the mold proper from cramping or binding, the ejector being of the push and pull type compels positive reseating of ejector pins in the molds.

THE SAXL STIFFNESS TESTER IS A PRACTICAL, simple, efficient instrument for the study of stiffness or elastic recovery for all types of sheet-like materials, such as plastics, paper, textiles, rubber, etc. The force necessary to deflect the test specimen is measured according to the function of equilibrium so that the numerical values of quantitative data of rigidity, stiffness, yield points, elastic recovery from bending stresses, etc., are firmly established. It is available from The R. Y. Ferner Co.

A PATENTED, COMBINED COLOR PYROMETER, whose measuring principle was evolved after years of scientific research and investigation, has been developed



by Pyrometer Instrument Co. It is a convenient and handy self-contained instrument for practical purposes. The present invention is based on the use of light filters and color wedges which are transparent to a number of

● The PACKLESS *Flex-Control* Self-Draining Hose provides the correct tension (adjustable) necessary to insure free, positive drainage. Flex-Control regulates the hose flexing . . . eliminates hose strain and reduces wear at couplings. No bolts in the couplings to shear off! Flex-Control and Seamless Flexible Metal Hose are sold as a unit—or separately. Write for details of four Flex-Control types. Patents pending.

PACKLESS METAL PRODUCTS CORP., LONG ISLAND CITY, NEW YORK

Packless

Flex-Control SELF-DRAINING HOSE 917

Best TO DATE!

The ALDRICH Central Hydraulic Pressure System.

- Aldrich high efficiency plunger pumps reduce operating costs.
- Aldrich Central Hydraulic Pressure Systems minimize maintenance costs.
- Either Hydro-Pneumatic or Dead Weight Accumulators produce an even load current with minimum pumping capacity.
- Fire hazard is eliminated by the use of non-inflammable hydraulic media.

ALDRICH

THE ALDRICH PUMP CO.
ALLENTOWN, PENNA.

A LESSON IN KNOBS

To successfully turn out difficult plastic masterpieces is no new experience for Kurz-Kasch. Nor is the mass production of smaller items such as radio knobs . . . each skillfully debossed with letters of gold.

Modern equipment, plus the recognized artistic skill of our large staff of trained molders, enable us to meet any requirement. With special molds or those furnished without charge from our large selection, Kurz-Kasch will give you an eye-appealing and serviceable product. . . made of any of the preferred materials.

KURZ - KASCH, Inc.
DAYTON, OHIO
Offices in New York, Chicago, Cleveland, Detroit, St. Louis, Los Angeles, Dallas and Milwaukee

KURZ-KASCH Inc.

EQUIPMENT

colors simultaneously. By using filters with a number of transparencies both for separation and for mixing and toning down, any complicated optical or mechanical device for the production or combination of colors is rendered superfluous and the creation of a surprisingly simple temperature measuring device in the form of colored discs is rendered possible. The new Pyro "Bi-Optical" pyrometer is the only instrument for technical and scientific measurements by which the temperature of the "black body" and the "actual" temperature may be ascertained simultaneously. The instrument is furnished with scale ranges from about 900–1900°C or 1700–3500°F. This new instrument may be used for innumerable laboratory and research applications including incandescent iron and iron alloys in the open and flame heated furnaces, etc.

AS A RESULT OF IMPROVEMENTS RECENTLY made by the Standard Machinery Company, the Standard Self-Contained Molding Presses can now be easily and economically adapted to a wide range of pressures. By either one of two simple adjustments, it is now possible to reduce the total rated capacity of a Standard Self-Contained Molding Press. For continued maintenance of pressure, a simple adjustment, requiring but a few seconds to make, in the high pressure pump release valve changes the pressure delivered on the platen of the pump from its total capacity to any desired point down to approximately one-third its rated capacity. The same results may be accomplished by lowering the position of the "thrust" block. An indicator attached to the block and a pressure scale on the guide make this an easy matter.

These two features, are of great advantage to shops doing diversified work that requires wide range of pressures, and to custom molders, who often find it necessary to mold with less pressure than the rated capacity of a press yet, because of the area of the mold, must use that press. These presses are made in 50, 100, 150, and 300-ton models.

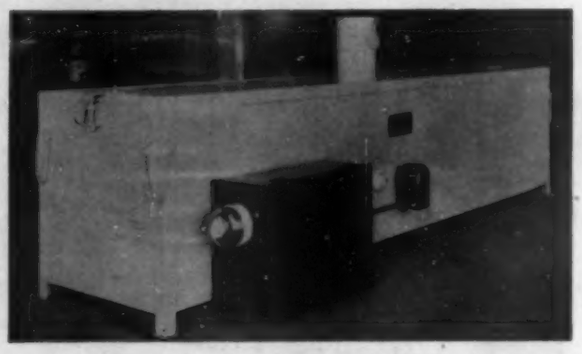
THE "ALNOR" PYROMETER CONTROLLER IS OFfered by Illinois Testing Laboratories, Inc., for those who desire to automatically control temperatures of heat treating furnaces, melting pots or other heating devices at a definite pre-determined point. The principle of operation is electronic similiar to a radio circuit. The pointer of the indicating pyrometer carries a small vane. An adjustable target is provided which carries two condenser plates or vanes. These vanes are the capacitive element of a tuned circuit.

Except at the point when the temperature indicating pointer and the target coincides the circuit is unchanged. When the temperature pointer with its vane approaches the temperature setting, the vanes of the pointer and target interleave and produce a circuit change which in turn operates a relay. The heating current if electric is shut-off or in case of the fuel fired operation, the fuel valve is closed partially or completely depending on the type of valve used. There is neither motor nor depressor bar used in the Alnor Controller nor is there any direct contact between the vanes. The temperature indicating pointer is free to give continuous indication and control.

PREHEATING MOLDING POWDER ESPECIALLY in briquetted form has been found in many shops to increase production. It brings the material more closely to the molding temperature thereby shortening the cycle of time required to plasticize the material in the mold. Preheating also drives off the surplus gases in the molding material and sometimes makes breathing of the mold unnecessary when specially large loads are being used.

Many shops find it to their advantage to preheat large inserts before placing them in the mold, so that the molding material will form around them readily. If cold inserts are placed in the mold, especially if they are of any considerable size, they have a tendency to delay the heating of the compound surrounding them until they themselves become heated almost to the molding temperature. Therefore when they are placed in the mold hot this delay is avoided, and the curing time shortened by that amount of time even though it is recorded in seconds.

Realizing the necessity for preheating and the added importance being attached to this development, the



Dispatch Oven Company has recently introduced an oven which may be loaded and discharged from either end; is of sufficiently heavy construction to maintain dependable heat; and is offered at a nominal price.

This particular unit is ideal to set on a bench or stand and is sufficiently inexpensive to permit its use at each group of molding presses where preheating is considered an advantage. The overall dimensions are 7 ft. 8 in. in length, 1 ft. 9 in. in width and 1 ft. 10 in. high with a drop-door at each end. It is heated with an electrical heating system that is controlled by an automatic bi-metallic thermo-regulator through necessary relay and contactor equipment which permits the operator to set the oven for the desired temperature and assures him that the oven will be held at that operating heat within close limits all the time regardless of whether any attention is paid to it or not. Photograph on request.

ACE SCORES AN ACE WITH THIS PRIZE WINNING JEWELRY SET

The high standards which Ace designers and fabricators have set in the creation of Costume Jewelry, Buttons, Buckles, also special parts for industrial purposes made of cast resin, has led many jobbers and manufacturers to seek such products from the Ace plant. To you we offer the fullest co-operation of our experienced staff and the complete facilities of our modern equipment.

ACE PLASTIC NOVELTY CORP.
476 JEFFERSON ST., BROOKLYN, N. Y.
For the Jobbing Trades Exclusively

GORTON DUPLICATORS

halve die costs

In the modern die and mold shop, all duplicate die and multiple cavity jobs and making originals from stone or plastic models are given to Gorton Duplicators.

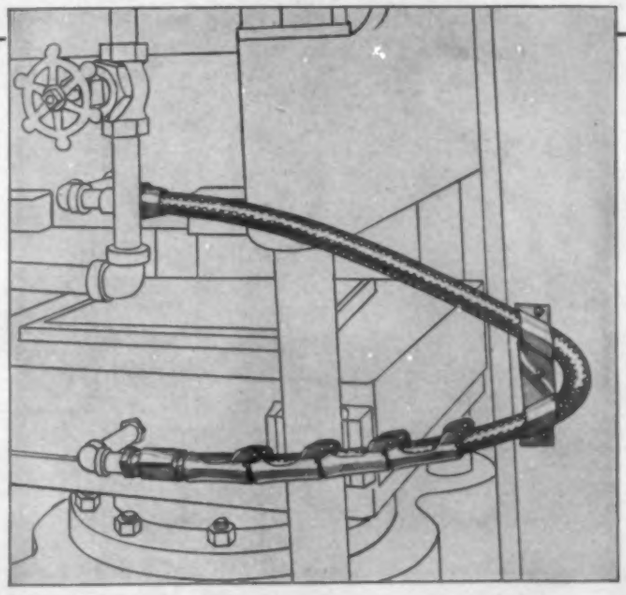
Savings in time and money averaging 50% and the advantage of being able to use semi-skilled men on precision work with Gorton Duplicators are too important to neglect wherever die and mold reproduction is a factor. Send for our bulletin 1319B.

GEORGE GORTON MACHINE CO.
1100 13TH ST. RACINE, WIS.

Now Available to Users of REX-WELD Flexible Metal Hose Connections

REX SELF-DRAIN SUPPORTS

PATENT APPLIED FOR



New Link Design—Most Practical Method of Supporting Long-Length Connections

Rex Self-Drain Supports—a Chicago Metal Hose Corporation engineering development—permits free movement of the unit at all times without allowing it to sag below the horizontal, and controls the flexing of the hose without unnecessary strain. Furnished as complete unit. Write today for new catalog illustrating and fully describing the many advantages of Rex Self-Drain Supports and Rex-Weld Flexible Metal Hose for platen press application.

CHICAGO METAL HOSE CORPORATION
Formerly Chicago Tubing & Braiding Co. (Established 1902)
Maywood, Illinois (Chicago Suburb)

REX-WELD "Super-Service" Jointless Flexible Steam Connections

TRANSPARENT PLASTICS FOR AIRCRAFT

(Continued from page 66)

Table 17—Accelerated shrinkage tests at 70°C of transparent plastic

Material	Sample	Thickness	Decrease in Length 4 Days	2 Weeks	1 Month	2 Months
		Mils	*Percent*	*Percent*	*Percent*	*Percent*
Cellulose acetate	*A3*	133	0.9	1.0	1.3	2.2
Do	*A1*	64	1.2	1.5	1.6	3.4
Do	*A2*	95	1.0	1.1	1.5	(*b*)
Do	*B2*	93	1.0	1.1	1.3	2.0
Do	*B3*	64	a1.3	2.1	...	...
Do	*B4*	96	1.1	1.5	1.8	1.7
Do	*B5*	100	2.0	3.5	4.2	4.8
Do	*B6*	66	1.7	2.0	2.5	3.1
Do	*B9*	89	1.4	1.8	2.2	2.3
Do	*B10*	63	1.1	1.6	2.2	2.4
Do	*B11*	64	1.0	1.6	2.2	2.5
Do	*B12*	61	0.8	1.1	1.2	1.2
Do	*C3*	125	.9	1.0	1.3	1.9
Do	*D1*	169	1.1	1.4	1.5	2.3
Cellulose acetobutyrate	*S1*	41	2.5	3.1	3.5	4.0
Cellulose nitrate	*E1*	67	0.4	0.4	0.6	1.1
Do	*F1*	64	.5	.5	.7	0.9
Ethylcellulose	*G1*	53	1.2	1.5	1.9	2.4
Do	*H1*	29	0.4	0.5	...	...
Do	*I1*	38	.5	.6	0.8	3.5
Acrylate resin	*J1*	66	2.2	(*b*)	(*b*)	(*b*)
Do	*J2*	76	0.2	0.2	0.2	0.7
Do	*K1*	124	2.0	2.0	2.0	...
Do	*K2*	88	1.8	1.8	1.8	2.0
Do	*K3*	71	1.5	1.6	1.7	1.7
Do	*K5*	118	0.2	0.3	0.3	...
Do	*K9*	60	a1.9	1.9	...	...
Vinyl chloride-acetate resin	*L1*	64	4.2	4.3	4.6	8.2
Vinyl acetal resin	*M1*	63	0.2	0.8	1.0	1.5
Do	*N1*	127	c.4	c.6	c0.6	c0.9
Glyceryl-phthalate resin	*O1*	162	.1	.1	.1	.1
Do	*T1*	290	.7	.7	.7	.7
Phenol-formaldehyde resin	*U1*	170	1.0	1.4	1.6	1.9

a 3 days. *b* Warped. *c* Increase in length.

Table 18—Outdoor shrinkage tests of transparent plastics

Material	Sample	Decrease in Length 1 Month	2 Months	3 Months	6 Months	9 Months	1 Year
		Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Cellulose acetate	*A1*	1.3	1.8	2.5	2.7	3.1	3.4
Do	*A2*	0.5	0.6	1.1	1.1	1.4	1.3
Do	*A3*	.4	.6	0.9	1.0	1.1	1.1
Do	*B2*	.4	.4	.6	0.6	0.7	0.8
Do	*B6*	.8	1.2	1.6	1.8	2.1	2.3
Do	*C3*	.5	0.7	1.1	1.2	1.3	1.3
Do	*D1*	.6	.9	1.4	1.4	1.6	1.5
Cellulose acetobutyrate	*S1*	.5	.7	0.9	1.0	1.0	1.1
Cellulose nitrate	*E1*	.2	.3	.4	0.4	0.4	0.5
Do	*F1*	.2	.3	.4	.4	.5	.6
Ethylcellulose	*G1*	0.6	1.1	1.5	(*a*)	(*a*)	(*a*)
Do	*H1*	1.0	1.5	2.0	(*a*)	(*a*)	(*a*)
Do	*I1*	0.8	1.1	1.4	1.8	(*a*)	(*a*)
Acrylate resin	*J1*	.05	.1	.1	.1	.1	.1
Do	*J2*	.0	.0	.0	.0	.0	.0
Do	*K1*	.0	.2	.2	.2	.2	.2
Do	*K2*	.06	...	...	.1	.1	.1
Do	*K6*	.0	...	.0	.05	.06	....
Do	*K9*	.04	.1	.2	.2	.2	.2
Vinyl chloride-acetate resin	*L1*	.0	.0	.0	.0	.03	.03
Vinyl acetal resin	*N1*	.4	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)
Glyceryl-phthalate resin	*O1*	.0	...	...	*b*.1	*b*.1	*b*.1
Do	*T1*	.0	.0	.0	.1	.1	.1
Phenol-formaldehyde resin	*U1*	.8	1.0	1.2	1.4	1.5	1.5

a Gage lines obliterated by deterioration of sample. *b* Increase in length.

(Please turn to the next page)

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SPECIFICATIONS

6 spindle speeds—410-645-1065-1595-2100 and 4250 RPM

Table 20¼" x 8½"

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Cross feed—11"

Vertical feed—15"

Travel of quill with micrometer depth stop—3½"

Circular table (extra) diameter—15"

Net weight—1500#

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MOLDED PLASTICS

Shrinkage

The shrinkage which transparent plastics undergo in service is an important factor in their durability. Excessive shrinkage causes buckling and in some cases cracking of the plastic sheet.

The shrinkage of transparent plastics occurring during exposure on the roof and also as a result of accelerated aging was studied. Specimens approximately 11 by 1 inch were conditioned at 21° C and 65 percent relative humidity and gage lengths of 10 inches were marked off. One set of samples was placed on an exposure rack on the roof, while a second set was subjected to accelerated aging at 70° C in an oven in which the air was circulated. After various periods the samples were removed to the conditioning room for 24 hours and the change in length was measured. The results are presented in Tables 17 and 18.

Bursting strength

Tests of bursting strength were made on a few specimens of cellulose acetate, cellulose nitrate and acrylate resin. Circular disks 7 inches in diameter of the various materials were cut out and conditioned at 21° C and 65 percent relative humidity. In the testing apparatus the specimen was held between steel clamping rings having an opening 5 inches in diameter. Hydraulic pressure from a hand pump was applied to one side of the disk and was increased until the disk was ruptured. The pressure to produce rupture was taken as a measure of the bursting strength. These tests were repeated with the specimen protected from the steel rings by rubber gaskets $^1/_{16}$ inch thick.

All specimens except the acrylate resins were greatly deformed by the test, and assumed a dome-like appearance. The results are presented in Table 23.

Table 23—Bursting tests on 5-inch disks of transparent plastics at approximately 25° C

A. WITHOUT RUBBER GASKETS

Material	Sample	Thickness *Mils*	Bursting Strength lb/in.²	Location of Failure
Cellulose acetate	*B2*	93	295	At clamping rings.
Do	*B3*	65	200	In center.
Do	*C1*	57	165	At clamping rings.
Do	*C3*	125	400	In center.
Cellulose nitrate	*W1*	93	375	At clamping rings.
Acrylate resin	*K5*	70	26	Do.
Do	*K10*	98	46	Do.
Vinyl acetal resin	*N1*	49	100	Pinhole developed between center and edge
Do	*N1*	49	115	At clamping rings.

B. WITH RUBBER GASKETS

Cellulose acetate	*B2*	93	340	At clamping rings (slipped in grips).
Do	*C1*	56	190	In center.
Do	*C3*	125	430	Do.
Cellulose nitrate	*W1*	93	380	Do.
Acrylate resin	*K10*	97	44	Between clamping rings.
Do	*K11*	65	33	At clamping rings.
Do	*K11*	73	32	Do.
Do	*K12*	97	45	Do.
Do	*K12*	98	45	Do.
Do	*K13*	202	117	Do.
Do	*K13*	185	100	Do.

Table 25—Bursting tests on 5-inch disks of laminated and plate glass

Type of Glass	Type of Plastic Lamination	Sample	Thickness *Mils*	Bursting Strength lb/in.²
Thin sheet safety	Acrylate	*Y1*	106	12
Sheet safety	Vinyl	*Z3*	117	19
Plate safety	Cellulose nitrate	*Z1*	196	33
Sheet safety	Cellulose acetate	*X6*	129	32
Thin plate	None	*X1*	83	12
$^1/_4$-inch plate	Do	*X4*	225	60

A few samples of laminated glass and plate glass were tested at 25° C in the same bursting-strength apparatus used for the plastic sheets. The results of these tests are presented in Table 25, and the condition of the laminated-glass products after test is shown in Fig. 20. Bursting strengths of these materials are considerably less than those observed for the cellulose acetate sheets.

Conclusion

Pending the results of further tests on samples of cellulose acetate, acrylate resin and other plastics, which have been prepared by the manufacturers using modified compositions and methods of processing, it is concluded that the problem of choosing between cellu-

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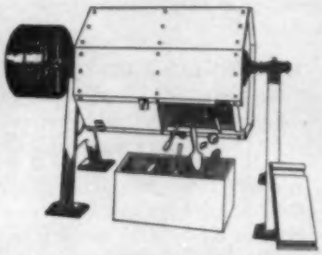

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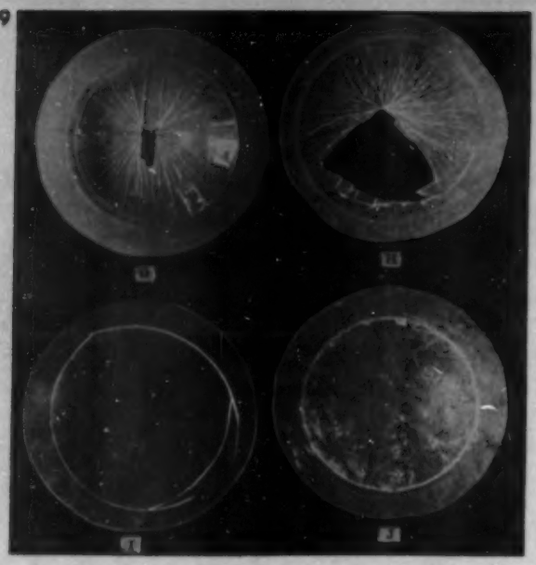
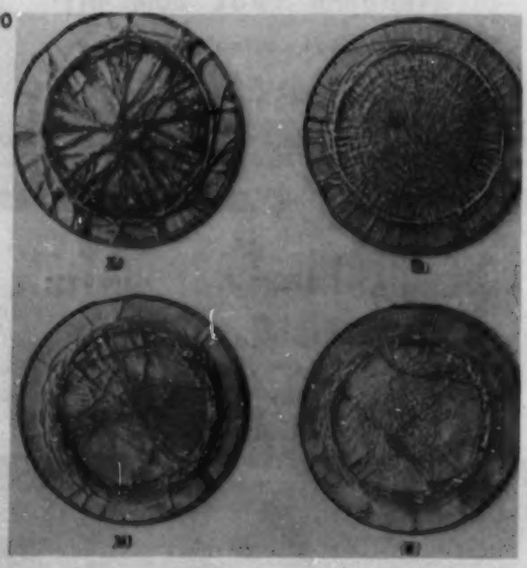


19. Samples of transparent plastics after bursting strength tests. (G) Cellulose acetate burst at about 25°C. (H) Cellulose acetate burst when one surface was cooled with ethylene dichloride at 35°C. (I) Acrylate resin burst at about 25°C. (J) Acrylate resin burst when one surface was cooled with ethylene dichloride at 35°C.

20



20. Samples of laminated glass after bursting strength tests. (K) Glass bonded with cellulose nitrate plastic. (L) Glass bonded with cellulose acetate plastic. (M) Glass bonded with vinyl resin plastic. (N) Glass bonded with acrylate resin plastic.

lose acetate and acrylate resin plastics for aircraft windows at present appears to be one of the required impact strength. If a relatively high impact strength is necessary, the cellulose acetate sheets are much superior to the acrylate resin in this respect. However, if high impact strength is not essential, then the superior clarity and weathering resistance of the acrylate resin makes it the more desirable material. Both the cellulose acetate and the acrylate resin have the advantages of being lighter in weight than glass and of being readily fitted to curved openings.

U. S. PLASTICS PATENTS

(Continued from page 74)

SHOE STIFFENER. C. E. Kinney (to Hercules Powder Co.). U. S. 2,094,709, Oct. 5. A resin which remains as a residue after refining rosin and consists of oxidized resin acids and terpenes together with polyphenols and terpene polymers is higher melting than rosin and is useful in box toes for shoes.

MOISTUREPROOF WRAPPER. A. R. Olsen (to Hercules Powder Co.). U. S. 2,094,717, Oct. 5. Moistureproofing transparent regenerated cellulose wrapping foils or glassine paper with a transparent film of chlorinated rubber and an abietic acid derivative.

MOISTUREPROOF COATING. Wm. H. Charch and A. Hershberger (to E. I. du Pont de Nemours and Co.). U. S. 2,094,771, Oct. 5. A moistureproofing coating for films or foils contains paraffin wax, pyroxylin and hydrogenated rosin in solution in amyl acetate, alcohol and toluene.

MOLDING COMPOSITION. Wm. L. Baxter (to United Shoe Machinery Corp.). U. S. 2,094,868, Oct. 5. A nonshattering fibrous molding composition capable of repeated hot molding is made of 65–80% raw sisal hemp fiber, and a waterproof thermoplastic binder.

RUBBER HALIDES. H. A. Winkelmann (to Marbon Corp.). U. S. 2,094,933, 2,094,934 and 2,094,935, Oct. 5. Halogen derivatives of rubber are produced by chlorinating rubber and reacting the product with glycerol, or by addition of hydrogen chloride to a partially chlorinated rubber, or by forming a hydrohalide and compounding the product with shellac.

ADHESIVE AND PLASTIC MATERIAL. Louis J. Fuhrmann. U. S. 2,095,093, Oct. 5. An adhesive and a plastic which hardens by drying are produced from distillery slop by alkaline hydrolysis of the concentrated, filtered slop, followed by addition of phenol and formaldehyde and partial evaporation to a viscous consistency.

CELLULOSIC FOILS. D. E. Drew (to E. I. du Pont de Nemours and Co.). U. S. 2,095,129, Oct. 5. Moisture-permeable regenerated cellulose foils are prevented from sticking together in storage by means of an antisticking composition of a soap and a resin.

ACIDPROOF COATING. A. J. Heberer and Wm. R. Marshall (to Glidden Co.). U. S. 2,095,250, Oct. 12. A highly acidproof and solvent-resistant coating is produced by forming a preliminary furfuryl alcohol-furfural condensation product, stopping the resinification by dissolving the initial resin in a solvent, adding a resinification catalyst and immediately applying the solution to the surface to be protected, so that the final insoluble resin is formed in place.

NEON SIGNS. G. Schneider (to Celanese Corp. of America). U. S. 2,095,291, Oct. 12. Embedding a neon sign in a transparent block of cellulose derivative, formed in separable halves with a groove in each half to fit over the neon tubing and form a gas-tight, water-tight support.

CELLULOSE ESTERS. C. I. Haney (to Celanese Corp. of America). U. S. 2,095,326, Oct. 12. Making stable cellulose esters by esterification with an organic acid in presence of an acid catalyst, an acetate of sodium, calcium, barium or aluminum and the stannate and aluminate of sodium followed by precipitation of the ester and part of the acetate together.

AMMUNITION. J. F. Hutchinson (to Remington Arms Co.). U. S. 2,095,333, Oct. 12. A lead nitrate primer for ammunition utilizes a starch ester as binder.

CELLULOSE ESTERS. J. E. Jones (to Celanese Corp. of America). U. S. 2,095,334, Oct. 12. Stabilizing solid cellulose acetate by passing through it a hot 0.01 to 0.03% aqueous sulfuric acid solution.

RUBBER-RESIN COMPOSITION. A. B. Cowdery (to Barrett Co.). U. S. 2,095,630, Oct. 12. Compounding rubber with a mixture of coal tar oil and coumarone resin.

PLASTIC. Emanuel M. Silberman. U. S. 2,095,652, Oct. 12. Making a plastic composition of a cellulose derivative, rosin and rosin oil, camphor, acetone and wood flour.

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CELLULOSE DERIVATIVES. Leon Lilienfeld. U. S. 2,095,524, Oct. 12. Condensing cellulose in presence of an alkali with an olefin halide.

LAMINATED PANEL. C. W. Krause (to Wilson and Co.). U. S. 2,095,706, Oct. 12. A composite laminated panel is made with a core of fabric impregnated with a blood binder and two facing layers of fabric impregnated with a synthetic resin binder.

STABLE CELLULOSE ESTERS. C. J. Malm and Chas. R. Fordyce (to Eastman Kodak Co.). U. S. 2,095,822, Oct. 12. Stabilizing organic acid esters of cellulose by treatment in a bath of propionic, butyric or valeric acid in which the ester is insoluble and is not hydrolyzed.

METAL LABEL. H. G. Kittredge and F. W. Williams (to Foilfilm, Inc.). U. S. 2,095,879, Oct. 12. A metal foil label with a synthetic resin adhesive backing.

MOISTUREPROOF WRAPPER. Wm. D. Wolfe (to Wingfoot Corp.). U. S. 2,095,898, Oct. 12. Priming a fibrous cellulosic base with a thin priming coat of rubber hydrochloride (chlorine content 29-30.5%) and coating with a rubber condensation product formed with an amphoteric metal halide.

SAFETY GLASS. W. Bauer and A. Gerlach (to Röhm and Haas Co.). U. S. 2,095,944, Oct. 12. Use of a polymerized ethyl acrylate, or a mixture of polymerized acrylates and methacrylates, as safety glass interlayer.

MOLDS FOR PHENOL RESINOIDS

(*Continued from page 64*) tic used and is relatively independent of the style of mold; therefore, the total molding cycle may be appreciably shortened only by increasing the rapidity of charging the mold and of the ejection of the finished parts. When quick-curing materials are used, semi-automatic molds are inherently conducive to high-speed production. A more uniform cure can usually be expected with semi-automatic mold equipments due to better heating characteristics; therefore, this type of mold is more practicable for molding plastics requiring long-time curing.

For Navy design molded pieces where the molded part is to be produced in such large numbers as to justify the procurement of the more expensive and complicated semi-automatic molds, care should be taken that the successful bidder on the first order does not thereby obtain a virtual monopoly of subsequent business on this particular part. If and when semi-automatic type molds are used, these molds should be required to be completely self-contained.

Number of cavities

Based on the number of cavities, the fourth classification, molds are classified as Single Cavity or Multiple Cavity.

It is in the matter of cavities that the greatest difference lies between the molds used for industrial production and those required for Naval production.

A few general rules may be laid down which govern the applications of single and multiple cavity molds for industrial production. Single cavity molds are employed generally under the following conditions:

In cases where a small quantity of relatively complicated parts are required.

When the molding is of such size as to require the total capacity of a press.

Where rate of production is of secondary importance and the volume of production can absorb only the minimum mold cost.

Where the raw material is not free flowing, particularly of the high-impact type.

Where the placing of metal inserts within the cavity is of sufficient complication to prohibit the economical use of multiple cavities.

As a test mold before constructing a multiple-cavity mold, to prove the design.

The converse of the above limitations as applied to single cavity molds, in general may be accepted for the application of multiple cavity molds. More specifically, multiple cavity molds are ordinarily high-production equipment; but due to their higher initial cost, their use is justified only where a large volume of production is to be expected. It is a great temptation to put a number of cavities in one mold in order to save on the direct labor cost, but this hoped for saving can be lost in so many other ways that it is highly important to consider the matter carefully. The selection of the number of cavities for a multiple cavity mold involves the careful study of the procurement factor involved in order to obtain the proper economic balance.

The present trend is away from large multiple-cavity molds, most molders preferring to use more molds, each having a small number of cavities. This is particularly true of parts of moderate complexity having inserts; but to some extent applies to even simple molded shapes without inserts. One reason for this is, of course, the expense involved in making large multiple-cavity molds which require large presses to mount them. Damage to one cavity is almost certain to occur sooner or later, and the damage then is likely to become progressive until finally the mold has to be scrapped. A multiplicity of smaller molds permits greatly flexibility of operation in the plant, and enables the molder better to match production to demand while maintaining an even flow of work. Damage to one cavity of one mold can be repaired without greatly slowing up normal production.

An important factor which should be considered in determining the number of cavities to build into a mold, is the number and type of inserts required. Where two molds are used, the time required to load the inserts should not exceed the molding time required, but should approximate it as closely as possible so that while one mold is in the press the operator can load and prepare the other. Where more than two molds are being used, loading time should be so related to curing and molding time that the operator can run a continuous process.

In the case of the production of pieces for Naval installations the stringent requirements for control of the density of the product point toward the minimum number of cavities, because the chances of keeping the grade of the piece to a high quality is increased with molds of few cavities.

For high impact materials, for Naval production, experience has shown conclusively that molds should be single cavity. High impact materials have a large bulk factor, making the loading of the cavities more difficult. With the possibility existing of even a slight differential

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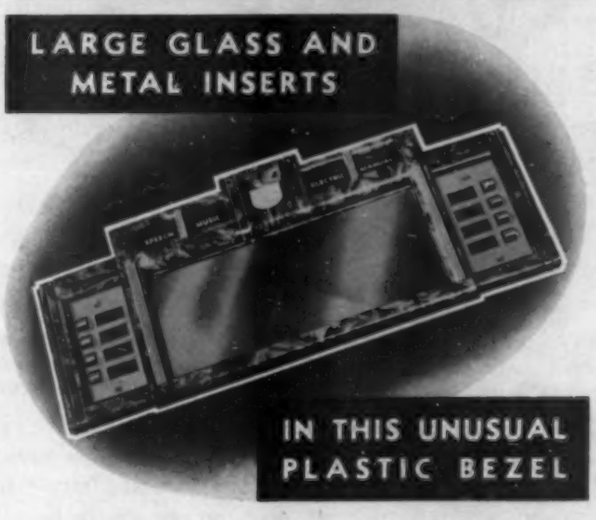

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in the amount of material in the cavities of a multi-cavity mold, it has been found that the pressures will vary, resulting in one cavity "taking the load."

For other than high-impact materials, it is safe to state that the employment of single versus multiple cavity molds, for Naval production, will follow somewhat closely the rules for selection set forth above for industrial uses.

Physical action

As regards the basic principle involved in their compression, or what may be termed the physical action of the plastic during molding operation, which is the fifth classification, molds are divided into types as follows:

Flash
Positive
Extrusion

Considering, in conjunction with the "physical action classification," the next three classifications: "Loading Principle," "Ejecting Principle" and "Raw Material," classifications may be established as follows:

As concerns the loading principle, molds involved are either

Cavity Loaded or
Filler Plate Loaded;

second, as to their closure molds, are

Complete
Spacer Fork
Spacer Fork, Spring Box;

and, third, with respect to their ejecting principle, molds are

Knockout Plate
Stripper Plate
Automatic;

Finally, as regards the form of the raw material used, molds may be classified as

Bulk or
Preformed.

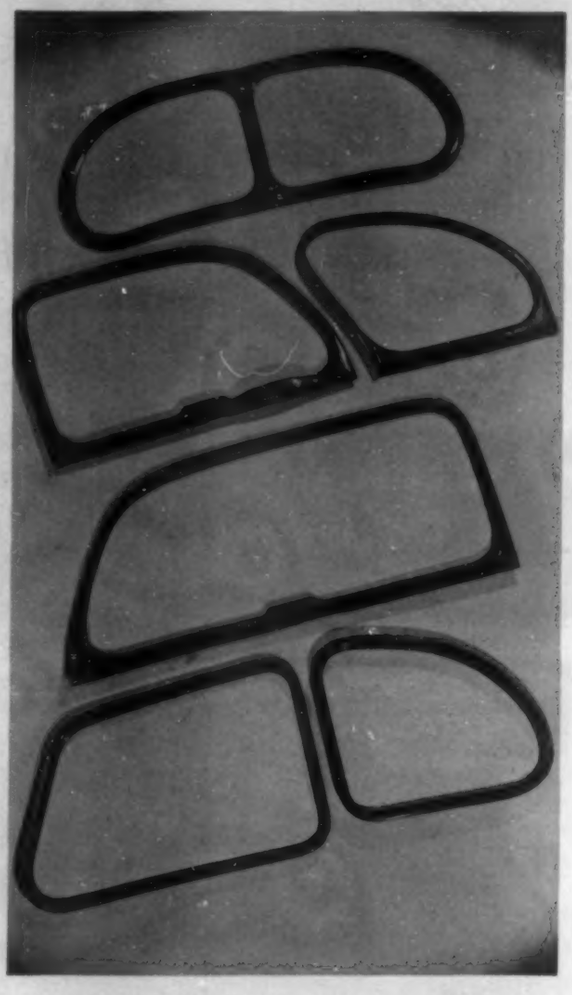
The classifications of "Loading," "Closure," "Ejecting" and "Raw Material" are all intimately connected with the "Physical Action Classification" and can be more clearly discussed as they become applicable under the various types of molds coming under that heading. *(To be continued in December.)*

BRITISH MOTOR CARS

(Continued from page 57) a car with plastics; that is, the windshield and ventilators. Some experimental work has been done with fabric plastics for wheels and one manufacturer is using such material for engine parts.

But one major company in England is using laminated glass right now and that is the Ford Company. Practically 80 to 90 percent of the cars in England are equipped with Triplex toughened glass which is heat treated and very hard. This disintegrates into small pieces which may fly, if broken, but doesn't cause serious injury. It is not easily broken and accidents have been seen where the glass has remained whole where the metal pressings on the body have been torn into ribbons. Phenolics can be molded directly onto this type of glass.

One car in England has been equipped with clear transparent acrylic resin sunshield with curved sides, but the prohibitive cost of this material prevents its being adopted generally. This particular car was done as a custom job and hasn't been long enough in use to determine just how the material will function. However, one company has been supplying this material for aircraft and practically all modern aircraft is now being equipped with acrylic hoods for cockpits. Its use in motor cars is prohibited first, because of cost, and secondly, because of scratching difficulties which are accentuated on automobiles because of their operation at ground level.



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If American automobile manufacturers should suddenly decide to avail themselves of the economies offered by phenolic garnish trim the demand would re-

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➡ **FOR SALE: 1—Stokes "DD" Rotary Preform Machine, never used; 1—Colton No. 5, Preform Machine 2½", with texrope drive and motor; 4 other Preform Machines, single punch up to 2"; 6—Hydraulic Pumps, high and low pressure, various sizes; 25—Hydraulic Molding Presses, all sizes. WANTED: Accumulators, Hydraulic Presses, all types. Reply Box 197, Modern Plastics.**

●

➡ **WANTED—PREFORM MACHINES: Will pay cash for idle or surplus Preform Presses—also Hydraulic Presses, Pebble Mills, Mixers, Sifters, etc. Send us your list. Reply Box 191, Modern Plastics.**

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➡ **HARDWOOD SAWDUST: We manufacture Dustless Double screened Maple and Birch Sawdust used in the Plastic Industry, in fine, medium and coarse sizes, also softwood. Ask for free samples and prices. National Sawdust Co., Inc., 104 North 6th Street, Brooklyn, N. Y.**

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➡ **Consulting Chemist will solve Plastics problems. Fine knowledge of manufacturing and formulae. Box 2, Station Y, Brooklyn, N. Y.**

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➡ **MANUFACTURING AND SALES EXECUTIVE, thoroughly experienced in Plastics desires connection. Reply Box 210, Modern Plastics.**

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➡ **Young man, 12 years' sales experience, desires to represent plastic molder or manufacturer, Detroit and Michigan territory. Reply Box 211, Modern Plastics.**

sult in some twenty-two million pounds of the material, or about twenty percent of the entire output of the industry for 1936.

If they should demand wood-grain effects which have been so successfully used in steel over a long period of years, they would find them available in plastic materials through a printing process which has recently been satisfactorily worked out by an American molder. This wood-grain effect, however, may not be of such important consideration so far as the purchaser is concerned because for a number of years now he has become accustomed to a plastic steering wheel which he really likes better than the cumbersome wheels which were once made of wood. He likes their flexible "feel" and their cleanliness as well as the light cheerful colors in which they are produced. Other interior accessories of plastics appeal to him, too, and he is well acquainted with them. The popularity of beautifully grained mahogany and walnut is by no means extinct but there is a marked trend toward lighter textures in home decoration and this may be an appropriate time for American car manufacturers to introduce the molded color of plastics for the better appearance of car interiors. Garnish trim is a good place to begin and its practicality has been ably demonstrated in England.

CELLULOSE ACETATE IN AMERICAN CARS

(*Continued from page 59*) the glove compartment. These molded panels occupy more than two hundred inches of instrument board space and weigh approximately 16 ounces each.

The new Nash has probably the largest number of instrument panel inserts. They total five in number and separate the indicator panel and glove compartment door giving the effect of a horizontal plastic band across the instrument panel. The center panel is curved and measures approximately 5 by $8^1/_2$ inches. All molded fittings which include the steering wheel are in a light pastel color matching the interior treatment. Thirteen molded pieces are used in the car.

A noticeable trend toward the use of larger plastic moldings is also seen in the general adoption of plastic-over-metal steering wheels. A survey of the cars revealed that nineteen cars were equipped with Tenite steering wheels as either optional or standard equipment. This is a marked increase over last year, when only six were shown.

Five molded inserts are used in this new Nash instrument panel

Car heater control knobs as they come from the injection press. Finished knobs in the foreground show metal inserts in place

The generous use of cellulose acetate plastic in the 1938 cars presents a good object lesson in the possibilities of this material through injection molding. One of the cars has 28 different injection-molded parts. This car is in the medium-priced class and will be produced at an estimated average rate of 900 units per working day during 1938. This means that approximately 25,000 parts per day must be molded in order to fill the demands of this one car. There are 30 molders in the United States and Canada busy producing cellulose acetate parts for the 1938 cars. If injection molding can serve Detroit, the master of mass production, there is no doubt that it can serve any industry well.

This is particularly true where the requirements are both speed and periodical change of design. In the case

Front and back of a molded dome light frame for one of the 1938 cars. All photos from Tenessee Eastman Corp.

of American motor cars, engineering principles are so well defined in each car that manufacturers are depending more and more every year upon the stimulus of new design and color. There is a shifting emphasis from motor design to body interiors. Beauty and comfort which are so dependent upon plastics are certain to become dominating themes in 1938 motor cars.